

Bibliography of Terrestrial Impact Structures

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Introduction

This bibliography encompasses in one report the individual bibliographies of 105 (12 proven and 93 probable) terrestrial impact structures. The bibliography of each impact structure was compiled for inclusion in an "Atlas of terrestrial impact structures" to be published at a later date. The bibliographies are being released in advance of the Atlas in order to make them immediately available to specialists interested in impact and cratering processes.

An attempt was made in this compilation to update the comprehensive bibliography of terrestrial impact structures and its supplement published earlier by the U.S. Geological Survey (Freeberg, 1966, 1969). In the last 15 years, the volume and range of the literature concerning impact structures has increased dramatically, making existing bibliographies incomplete.

Historical Guide to Literature on Terrestrial Impact Structures

Since the late 1950's, the subject of meteorite impact on Earth has attracted hundreds of research workers from many disciplines. Over the years, the emphasis on its different scientific aspects has followed the development of planetology. Most of the major developments in meteorite-impact research were punctuated by a symposium that both highlighted and keynoted the main results of on-going research, and emphasized their significance with respect to developments in allied disciplines. The proceedings of these symposia are referenced below, because each of them is an index to much of the specialized literature that was being published at the time they were held:

French, B. M., and Short, N. M., eds., 1968, Shock metamorphism of natural materials: Proceedings of the First Conference held at NASA, Goddard Space Flight Center, Greenbelt, Maryland, April 14-16, 1966, Baltimore, MD, Mono Book Corporation. 644 p.

Roddy, D. J., Pepin, R. O., and Merrill, R. B., eds., 1977, Impact and explosion cratering: Planetary and terrestrial implications: Proceedings of the Symposium on Planetary Cratering Mechanics, Flagstaff, Arizona, September 13-17, 1976: New York, Pergamon Press, 1,301 p.

Silver, L. T., Schultz, P. H., and others, eds., 1982, Geological implications of impacts of large asteroids and comets on the earth: Papers presented to the Conference on Large Body Impacts and Terrestrial Evolution: Geological, Climatological, and Biological Implications, Snowbird, Utah, October 19-22, 1981: Geological Society of America Special Paper 190, 528 p.

Of equal importance to these three symposia in setting the direction of meteorite-impact research has been work on multi-ring basins, asteroids, and comets. The research on multi-ring basins is summarized in:

Schultz, P. H., and Merrill, R. B., eds., 1981, Multi-ring basins: Proceedings of the Conference on Multi-Ring Basins: Formation and Evolution: Houston, Texas, November 10-12, 1980; Proceedings of Lunar and Planetary Science, v. 12, Part A: Geochimica et Cosmochimica Acta, Supplement 15, 295 p.

The leaders in research on asteroids and comets that bears on the origin of bodies impacting on the Earth have been Öpik, Shoemaker, Urey, and Wetherill.

In the 1960's, interest in meteorite impact on Earth centered on 1) the very large energies released and associated effects produced by impact and man-made nuclear explosions (Bolt, 1976); and on 2) the morphological analogy of lunar craters to fresh terrestrial impact structures. Quite appropriately, the Conference on shock Metamorphism of Natural Materials in April 1966 linked the results of shock-wave research that had been derived from investigations

of meteorite-impact structures, nuclear explosions, and laboratory experiments. As the Inner and Outer parts of the Solar System were explored in the 1970's, largely as a result of the Planetology Program of the National Aeronautics and Space Administration (NASA), interest in cratering mechanics increased--it was realized that cratering by impact had played a major role in the evolution of all terrestrial planets and the satellites of the outer planets. The Symposium on Planetary Cratering Mechanics in September 1976 provided a forum for the most active researchers in impact and explosion cratering to exchange ideas and state-of-the-art techniques, and to discuss areas of common interest. A number of papers in the proceedings of this symposium deal with cratering phenomenology and terrestrial cratering.

Lately, research in terrestrial impact structures has received a new orientation and a tremendous boost, following the formulation by Alvarez and others (1980) of an hypothesis that suggests impact as the cause of the world-wide Cretaceous-Tertiary biological extinctions. This hypothesis, inspired by the discovery of iridium anomalies at the Cretaceous-Tertiary boundary, re-introduced catastrophism as a catalyst and a driving force into contemporary geologic thought. It was the backdrop against which the Conference on Large-Body Impacts was convened in October 1981.

The origin of bodies that formed terrestrial impact structures has been a matter of conjecture and controversy for a very long time. These bodies are now known to have been meteorites, unrelated to planetesimals, like those that collided with other bodies of the Inner Solar System very early in its history to create very large basins. The origin of impacting populations in very early Archean time, the origin and behavior of Earth-crossing asteroids and comets, and impact-cratering rates are three fields of research critical to the understanding of space and time distributions of terrestrial impact

structures. These fields have rapidly expanded during the past decade, yet they have not been the themes of specialized symposia. For that reason, bibliographies--necessarily incomplete--dealing with these topics are also included in this compilation.

The economic importance of some terrestrial impact structures was not recognized until long after they had been developed for mining of ore (Sudbury Basin, Vredefort Structure, Carswell Lake Structure), or petroleum extraction (Red Wing Creek, Steen River Structure). Dietz (1961, 1964) and French (written communication, 1969) drew attention to the economic potential of several of these structures, but so far their economic interest as a group has paled in comparison to their serving as mute testimony to one of the major planetary geologic processes.

Purpose and Scope

This compilation is based on the list of proven and probable impact structures most recently updated by Grieve (1982). It includes the 11 proven craters listed by Shoemaker and Eggleton (1961) in their crater category 1 (craters or clusters of craters with associated meteorites). To it, Grieve added the Morasko Craters in Poland, which he upgraded from category 6 of Shoemaker and Eggleton (1961). It does not include, however, Sobolev, Asian USSR listed in this group by Grieve and Robertson (1979), Masaytis and others (1980) and Shoemaker (1983), nor Monturaqui Crater (Shoemaker, 1983).

The craters listed in categories 2, 3 and 4 of Shoemaker and Eggleton (1961) are now considered probable impact structures, with the following exceptions: Richat Crater, Mauritania; Pretoria Salt Pan, South Africa; Glasford Structure, Illinois; Howell Structure, Tennessee; Jephta Knob Structure, Kentucky; Kilmichael Structure, Mississippi; and the Versailles Structure, Kentucky. Many of the craters in categories 5 and 6 of Shoemaker

and Eggleton (1961) have been upgraded by Grieve (1979, 1982) to "probable impact structure" status; they are as follows: Upheaval Dome, Utah; Amguid Crater, Algeria; Carswell Lake Structure, Saskatchewan; Deep Bay, Saskatchewan; Glover Bluff Structure, Wisconsin; Lac Couture, Quebec; Lake Dellen, Sweden; Lake El'Gytkhyn, U.S.S.R.; Lake Mien, Sweden; Lake Siljan, Sweden; Patomskii Crater, U.S.S.R.; Pilot Lake, Northwest Territories, Canada; Sudbury Basin, Ontario; Tenoumer Crater, Mauritania; and West Hawk Lake, Manitoba. Upheaval Dome, Utah, and the Glover Bluff Structure, Wisconsin, though not listed by Grieve (1982), are included in this compilation as a result of work since 1982. Many additional impact structures not listed by Shoemaker and Eggleton (1961) are considered by Grieve (1982) to be probable impact craters, and are included in this compilation.

No attempt to evaluate the entries has been made, as had been done by Freeberg in her 1966 bibliography and 1969 supplement, because of the vast increase in number of entries. Most of them were read, however, prior to the preparation of the Atlas referred to above. Since 1975 there has been an increasing trend toward in-depth analysis of many terrestrial impact structures, and a greater range of specialized studies in geomorphology, petrography, age dating, crater mechanics, paleomagnetism, geophysics, geochemistry and cosmochemistry, regional field geology, and archeology. Such specialization has coincided in part with investigations sponsored under the NASA Planetology Program. The cutoff date on most entries is mid-1983, but a few 1984 entries are included.

Impact structures are listed alphabetically by continent. No proven nor probable impact structures are listed for Greenland and the Antarctic, and none is known on the ocean floor (Eckhoff and Vogt, 1981). However, the hypothesis that very large impact basins in early Archean time were the

original ocean basins has many supporters. Chenoweth (1958), Dietz (1959), Harrison (1960), and Girty, (1961, 1962) advocated the hypothesis before Mesozoic and Cenozoic ocean-floor spreading became known as the generating mechanism of present ocean-floor crust. Thereafter, its supporters included Frey (1980) and Grieve (1980). Each continent is listed below in decreasing order, according to the amount of research in impact structures that it has generated:

	<u>Number of proven</u> <u>impact structures</u>	<u>Number of probable</u> <u>impact structures</u>
North America: Total 39		
USA: 16		
Arizona	1	
Indiana		1
Iowa		1 (Manson Structure: buried)
Kansas	1	
Kentucky		1
Missouri		2
North Dakota		1 (Red Wing Creek: buried)
Ohio		1
Tennessee		2
Texas	1	2
Utah		1
Wisconsin		1
Canada: 23		
Alberta		1 (Steen River Structure: buried)
Manitoba		2
Newfoundland (Labrador)		1

Northwest Territories		3
Ontario		5
Quebec		8
Saskatchewan		3
South America: Total 5		
Argentina	1	
Brazil		3
Chile		1
Australia: Total 11		
Western Australia	2	3
Northern Territory	2	4
Europe (exclusive of USSR): Total 10		
Finland		3
France		1
Germany		2
Poland	1	
Sweden		3
European USSR: Total 18		
Byelorussian SSR		1 (Logoisk: buried)
Estonian SSR	1	
Karelian SSR		1
Latvian SSR		1 (Kjardla: buried)
Lithuanian SSR		2 (Misarai and Vepriaj: both buried)
Russian SFSR		5 (of which Kaluga, Kamensk-Gusev, Kursk, and Puchezh-Katunki are buried)
Tatar SSR		1

Ukrainian SSR

**6 (of which Boltys, Il'inets, Obolon,
Rotmistrovka, and Zelenyy-Gay are buried)**

Asia: Total 12

India 1

Mongolia 1

Saudi Arabia 1

Asian USSR: Total 9

Kazakh SSR 2

Primoriye Terr. 1

Russian SFSR 4 (of which Kara is partly buried)

Yakotskh SSR 1

Africa: Total 10

Algeria 4

Ghana 1

Libya 2

Mauritania 2

South Africa 1

Most impact structures in the European USSR (13) are buried under sedimentary rocks, and are detectable only by geophysical methods or drilling (Masaytis, 1975; Masaytis and others, 1978; 1980).

Meteoritic components or enrichment in meteoritic-signature elements have been identified in the following 18 probable impact structures (Grieve and others, 1981; Grieve, 1982):

North America

Canada

Clearwater Lake East, Quebec

Gow Lake, Saskatchewan

Nicholson Lake, N.W. Territories

Wanapitei Lake, Ontario

South America

Monturaqui Crater, Chile

Australia

Strangways, Northern Territory

Europe

Chassenon Crater, France

Lake Lappajarvi, Finland

Lake Mien, Sweden

Lake Saaksjarvi, Finland

Obolon, Ukrainian SSR, USSR

Rieskessel, Germany

Asia

Kara, RSFSR, USSR

Popigay, USSR

Sobolev, USSR

Tabun-Khara-Obo, Mongolia

Zhamanshin, KSSR, USSR

Africa

Aouelloul Crater, Mauritania

Nomenclature

At present, the naming of terrestrial impact structures is not standardized. Many impact sites are known only by a local geographic name of unknown designation. Where a qualifier has been added to the geographic name, no orderly system of rules is being followed, such as been devised by the Working Group for Planetary Systems Nomenclature of the International Astronomical Union for the surficial features of other planets. Some qualifiers imply a topographic feature: lake, bay, island, area, mound, or crater. Others have a vague geologic structural connotation: disturbance, dome, basin, or ring. Redundant meanings in adding English names to foreign designations are common: i.e. in the name Lake Janis'yarvi (Karelian SSR), the baltic name "Jarvi" means "Lake". Further, nothing is more confusing to the nonspecialist than to name as "crater" an impact structure so completely eroded that all morphological and most structural evidence of the original impact depression are lacking. A case in point is Chassenon Crater, France, where "crater" has a genetic connotation, and is not taken in its usual topographic or structural sense. The term "astrobleme", applied by Dietz (1961) to circular features that are "obliterated craters made by a meteorite or the head of a comet", should be reserved for deeply eroded impact structures.

Several terrestrial impact structures have more than one name or spelling. The names adopted in this compilation follow U.S. Geological Survey usage as established by Freeberg (1966, 1969); Grieve's (1982) spelling is used for craters not listed by Freeberg. Alternate names appear in the individual entries and in an index. None of the names in this compilation were checked for official spelling and usage against national gazeteers or those of the U.S. Department of State.

Locations of Impact Sites

Locations of the structures are shown on sketch maps of six continents: North America, South America, Australia, Europe, Asia, and Africa (figs. 1 through 6). The geographic coordinates of each structure are given in the tables that precede the bibliographies of structures for each continent. The locations of a few structures in previous lists, including that of Grieve (1982), have been corrected if they have been plotted on a recently published map, or if a more accurate geographic description has since been supplied.

Iron Meteorites, Tektites and Microtektites, and Impact Glass

Iron meteorites associated with proven impact craters are referenced under pertinent impact structures according to the citations by Buchwald (1975). It is now generally agreed that tektites are of terrestrial origin, and that they originate at impact sites. Tektite literature is immense, and rather than include a bulky, yet incomplete bibliography of tektites in this compilation, selected references on moldavites were added to the Rieskessel bibliography, those on Ivory Coast tektites and microtektites to that of Lake Bosumtwi, Ghana, and those on Libyan Desert Glass (LDG) to that of the two Libyan impact structures: Oasis and BP. Similarly, references to Aouelloul glass and zhamanshinites will be found respectively in the bibliographies of Aouelloul Crater, Mauritania, and Zhamanshin, Kazakh SSR.

Earlier Bibliographies

Grieve's list of 1982, although authoritative, is only the most recently published of many lists, catalogues, and summary bibliographies of terrestrial impact structures. This compilation would be incomplete without guiding users to at least some of them, including the most comprehensive one for the USSR (Masaytis and others, 1980). So, a bibliography of impact-structure bibliographies is also included in the compilation, supplemented by a

bibliography of early articles on cryptovolcanic and cryptoexplosion structures, and one on astrons (Norman and Churwul-Ike, 1977), those enigmatic, very large, circular features reported from time to time on the Earth's surface, but as yet of unknown origin, and unstudied because of their very large dimensions.

Serials

Serials cited in this bibliography are not listed separately. The need for such a list is obviated by complete titles being given in the citations by authors, as against the abbreviated titles in Freeberg's 1966 bibliography and its 1969 supplement. The issuing agency or commercial publisher is indicated. An author index is included at the end of this compilation.

Conclusion

The number of known terrestrial impact structures will undoubtedly expand more dramatically in the next 30 years than in the past 30. Vast areas of all continents still remain inadequately surveyed for impact structures, even where the geologic environment is mapped at an adequate scale. Most of the South American and African continents is blank with respect to the actual density of preserved impact structures, as are the northwestern part of North America, eastern Australia, northeastern Europe, and all of China and northeast Asia (figs.). Moreover, additional impact structures may be discovered from now on at a higher rate than in the past, as future searches become more systematic rather than merely fortuitous or a result of serendipity. At the moment, interested geologists and astronomers make a deliberate attempt to match the predicted crater density on land with changing impact-cratering rates in Precambrian and Phanerozoic times on one hand, and the rates of crater erosion and preservation on the other (Fedynskiy and Khryanina, 1976; Dachille, 1977; Grieve and Dence, 1979; Shoemaker and others,

1979a and b; Weissman, 1982; Wetherill and Shoemaker, 1982; Grieve, 1983, 1984; Shoemaker, 1983).

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This study was initiated by Robert Bryson of the Lunar Programs Office in 1974 and continued under NASA contract No. W13,130.

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Map of North America showing the distribution of poor quality original fossils. The map includes labels for various locations across Canada and the United States, such as Nicholson Lake, Pilot Lake, Carstall, Gow Lake, Deep Bay, St. Martin, W. Hawk Lake, Red Wing Creek, Upheaval Dome, Barringer, Odessa, Sierra Madera, Bee Bluff, Houghton, Quebec, Lac Cature, Clearwater Lake West, Mistassin, Clearwater Lake East, Manicougan, Ile Rouleau, Charlevoix, Manapit, Brent, Holland, Slate Islands, Sudbury, Glover Bluff, Manson, Kettland, Decaturville, Wills, Serpent, Midd, Crooked Creek, Flynn Creek, and Houghton. A scale of miles (0 to 600) and latitude/longitude markings are also present.

0 200 400 600 110

SCALE OF MILES

Table 1a. North America: Impact Structures (in alphabetical order)
USA

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Proven impact craters</u>									
Barringer Crater, Alternate names: Canyon Diablo, Ninninger Crater, Meteor Crater Coconino County, Arizona	35°02'N 111°01'W	G-19	039/035	110J-17313 Nov. 3, 1972 1103-17330 Nov. 3, 1972	1.2				
Haviland Crater, Kiowa County, Kansas	37°35'N 99°10'W	G-20	031/034	1257-16404 April 6, 1973	0.011				
Odessa Craters, Ector County, Texas	31°48'N 102°30'W	G-19 H-23	032/038	1348-16532 July 6, 1973	0.168				
<u>Probable impact craters and astroblemes</u>									
Bee Bluff, Alternate name: Uvalde Zavala County, Texas	29°02'N 99°51'W	H-23	030/040	1130-16431 Nov. 30, 1972	2.4	<40	Sed	2	S
Crooked Creek structure, Crawford County, Missouri	37°50'N 91°23'W	G-20	026/034	1036-16165 Aug. 28, 1972	5.6	320±80	Sed	6	C
Decaturville Disturbance Camden County, Missouri	37°54'N 92°43'W	G-20	027/034	1073-16224 Oct. 4, 1972	6	<300	Sed (Cry)	6	C
Flynn Creek structure, Jackson County, Tennessee	36°16'N 85°37'W	G-20 G-21	022/035	1086-15544 Oct. 17, 1972	3.8	360±20	Sed	3	C
Glover Bluff structure, Marquette County, Wisconsin	43°58'N 89°32'W	F-18	026/029	1378-16144 Aug. 5, 1973					
Kentland structure, Newton County, Indiana	40°45'N 87°25'W	F-18 G-20	024/032	1088-16050 Oct. 19 1972	13	300	Sed	7	C

Table 1a (Continued)

Manson structure, Calhoun County, Iowa	42°35'N 94°31'W	F-17	029/031	1291-16335 May 10, 1973	32	<70	Sed&Cry	4	C
Middlesboro Basin, Bell County, Kentucky	36°37'N 83°44'W	G-21	020/035	1084-15431 Oct. 15, 1972	6	300	Sed	7	C
Red Wing Creek, McKenzie County, North Dakota	47°40'N 102°30'W	F-17	036/027	2618-16504 Oct. 1, 1976	9	200	Sed	4	C
Serpent Mound structure, Adams County, Ohio	39°02'N 83°25'W	G-21	021/033	1103-15482 Nov. 3, 1972	6.4	300	Sed	7	C
Sierra Madera structure, Pecos County, Texas	30°36'N 102°55'W	H-23	032/039	1276-16543 April 25, 1973	13	100	Sed	6	C
Upheaval Dome, San Juan County, Utah	38°27'N 109°56'W	G-19	039/033	1769-17213 Aug. 31, 1974					
Wells Creek area, Stewart County, Tennessee	36°23'N 87°40'W	G-20	023/035	1105-16004 Nov. 6, 1972	14	200±100	Sed	7	Cr

* ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form. Largest crater in a field of 3 craters.

Table 1b. North America: Impact Structures (in order of increasing latitude)
USA

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Tables 1 and 2)	Target Rock	Pres.	Morph.
<u>Proven impact craters</u>									
Odessa Craters, Ector County, Texas	31°48'N 102°30'W	G-19 H-23	032/038	1348-16532 July 6, 1973	0.168				
Barringer Crater, Alternate names: Canyon Diablo, Ninninger Crater, Meteor Crater Coconino County, Arizona	35°02'N 111°01'W	G-19	039/035 039/036	1103-17313 Nov. 3, 1972 1103-17330 Nov. 3, 1972	1.2				
Haviland Crater, Kiowa County, Kansas	37°35'N 99°10'W	G-20	031/034	1257-16404 April 6, 1973	0.011				
<u>Probable impact craters and astroblemes</u>									
Bee Bluff, Alternate name: Uvalde Zavala County, Texas	29°02'N 99°51'W	H-23	030/040	1130-16431 Nov. 30, 1972	2.4	<40	Sed	2	S
Sierra Madera structure, Pecos County, Texas	30°36'N 102°55'W	H-23	032/039	1276-16543 April 25, 1973	13	100	Sed	6	C
Flynn Creek structure, Jackson County, Tennessee	36°16'N 85°37'W	G-20 G-21	022/035	1086-15544 Oct. 17, 1972	3.8	360±20	Sed	3	C
Wells Creek area, Stewart County, Tennessee	36°23'N 87°40'W	G-20	023/035	1105-16004 Nov. 6, 1972	14	200±100	Sed	7	Cr
Middlesboro Basin, Bell County, Kentucky	36°37'N 83°44'W	G-21	020/035	1084-15431 Oct. 15, 1972	6	300	Sed	7	C
Crooked Creek structure, Crawford County, Missouri	37°50'N 91°23'W	G-20	026/034	1036-16165 Aug. 28, 1972	5.6	320±80	Sed	6	C

Table 1b (Continued)

Decaturville Disturbance Camden County, Missouri	37°54'N 92°43'W	G-20	027/034	1073-16224 Oct. 4, 1972	6	<300	Sed (Cry)	6	C
Upheaval Dome, San Juan County, Utah	38°27'N 109°56'W	G-19	039/033	1769-17213 Aug. 31, 1974					
Serpent Mound structure, Adams County, Ohio	39°02'N 83°25'W	G-21	021/033	1103-15482 Nov. 3, 1972	6.4	300	Sed	7	C
Kentland structure, Newton County, Indiana	40°45'N 87°25'W	F-18 G-20	024/032	1088-16050 Oct. 19 1972	13	300	Sed	7	C
Manson structure, Calhoun County, Iowa	42°35'N 94°31'W	F-17	029/031	1291-16335 May 10, 1973	32	<70	Sed&Cry	4	C
Glover Bluff structure, Marquette County, Wisconsin	43°58'N 89°32'W	F-18	026/029	1378-16144 Aug. 5, 1973					
Red Wing Creek, McKenzie County, North Dakota	47°40'N 102°30'W	F-17	036/027	2618-16504 Oct. 1, 1976	9	200	Sed	4	C

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

Largest crater in a field of 3 craters.

Table 1c. North America: Impact Structures (in order of decreasing diameter)
USA

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Tables 1 and 2)	Target Rock	Pres.	Morph.
<u>Proven impact craters</u>									
Barringer Crater, Alternate names: Canyon Diablo, Ninniger Crater, Meteor Crater Coconino County, Arizona	35°02'N 111°01'W	G-19	039/035	1103-17313 Nov. 3, 1972 1103-17330 Nov. 3, 1972	1.2				
Odessa Craters, Ector County, Texas	31°48'N 102°30'W	G-19 H-23	032/038	1348-16532 July 6, 1973	0.168				
Haviland Crater, Kiowa County, Kansas	37°35'N 99°10'W	G-20	031/034	1257-16404 April 6, 1973	0.011				
<u>Probable impact craters and astroblemes</u>									
Manson structure, Calhoun County, Iowa	42°35'N 94°31'W	F-17	029/031	1291-16335 May 10, 1973	32	<70	Sed&Cr	4	C
Wells Creek area, Stewart County, Tennessee	36°23'N 87°40'W	G-20	023/035	1105-16004 Nov. 6, 1972	14	200±100	Sed	7	Cr
Kentland structure, Newton County, Indiana	40°45'N 87°25'W	F-18 G-20	024/032	1088-16050 Oct. 19 1972	13	300	Sed	7	C
Sierra Madera structure, Pecos County, Texas	30°36'N 102°55'W	H-23	032/039	1276-16543 April 25, 1973	13	100	Sed	5	C
Red Wing Creek, McKenzie County, North Dakota	47°40'N 102°30'W	F-17	036/027	2618-16504 Oct. 1, 1976	9	200	Sed	4	C
Serpent Mound structure, Adams County, Ohio	39°02'N 83°25'W	G-21	021/033	1103-15482 Nov. 3, 1972	6.4	300	Sed	7	C

Table 2c (Continued)									
Decaturville Disturbance Randall County, Missouri	37°54'N 92°43'W	G-20	027/034	1073-16224 Oct. 4, 1972	6	<300	Sed (Cry)	5	C
Middlesboro Basin, Bell County, Kentucky	36°37'N 83°44'W	G-21	020/035	1084-15431 Oct. 15, 1972	6	300	Sed	7	C
Crooked Creek structure, Crawford County, Missouri	37°50'N 91°23'W	G-20	026/034	1036-16165 Aug. 28, 1972	5.6	320±80	Sed	6	C
Flynn Creek structure, Jackson County, Tennessee	36°16'N 85°37'W	G-20 G-21	022/035	1086-15544 Oct. 17, 1972	3.8	360±20	Sed	3	C
Bee Bluff, Alternate name: Uvalde Zavala County, Texas	29°02'N 99°51'W	H-23	030/040	1130-16431 Nov. 30, 1972	2.4	<40	Sed	2	S
Glover Bluff structure, Marquette County, Wisconsin	43°58'N 89°32'W	F-18	026/029	1378-16144 Aug. 5, 1973					
Upheaval Dome, San Juan County, Utah	38°27'N 109°56'W	G-19	039/033	1769-17213 Aug. 31, 1974					

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

No. 1: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

Largest crater in a field of 3 craters.

Table 1d. North America: Impact Structures (in order of increasing geologic age)
USA

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Tables 1 and 2)	Target Rock	Pres.	Morph.
<u>Proven impact crater detectable on Landsat MSS images</u>									
Barringer Crater, Alternate names: Canyon Diablo, Ninninger Crater, Meteor Crater Coconino County, Arizona	35°02'N 111°01'W	G-19	039/035	1103-17313 Nov. 3, 1972	1.2				
			039/036	1103-17330 Nov. 3, 1972					
<u>Probable impact craters and astroblemes detectable on Landsat MSS images</u>									
Upheaval Dome, San Juan County, Utah	38°27'N 109°56'W	G-19	039/033	1769-17213 Aug. 31, 1974					
Sierra Madera structure, Pecos County, Texas	30°36'N 102°55'W	H-23	032/039	1276-16543 April 25, 1973	13	100	Sed	6	C
Middlesboro Basin, Bell County, Kentucky	36°37'N 83°44'W	G-21	020/035	1084-15431 Oct. 15, 1972	6	300	Sed	7	C
<u>Probable impact craters and astroblemes barely detectable on Landsat MSS images</u>									
Red Wing Creek, McKenzie County, North Dakota	47°40'N 102°30'W	F-17	036/027	2618-16504 Oct. 1, 1976	9	200	Sed	4	C
Wells Creek area, Stewart County, Tennessee	36°23'N 87°40'W	G-20	023/035	1105-16004 Nov. 6, 1972	14	200±100	Sed	7	Cr
Serpent Mound structure, Adams County, Ohio	39°02'N 83°25'W	G-21	021/033	1103-15482 Nov. 3, 1972	6.4	300	Sed	7	C
Crooked Creek structure, Crawford County, Missouri	37°50'N 91°23'W	G-20	026/034	1036-16165 Aug. 28, 1972	5.5	320±80	Sed	6	C

Table 1d (Continued)
Proven impact craters not detectable on Landsat MSS images

Odessa Craters, Ector County, Texas	31°48'N 102°30'W	G-19 H-23	032/038	1348-16532 July 6, 1973	0.168				
Haviland Crater, Kiowa County, Kansas	37°35'N 99°10'W	G-20	031/034	1257-16404 April 6, 1973	0.011				
Probable impact craters and astroblemes not detectable on Landsat MSS images									
Bee Bluff, Alternate name: Uvalde Zavala County, Texas	29°02'N 99°51'W	H-23	030/040	1130-16431 Nov. 30, 1972	2.4	<40	Sed	2	S
Manson structure, Calhoun County, Iowa	42°35'N 94°31'W	F-17	029/031	1291-16335 May 10, 1973	32	<70	Sed&Cry	4	C
Glover Bluff structure, Marquette County, Wisconsin	43°58'N 89°32'W	F-18	026/029	1378-16144 Aug. 5, 1973					
Kentland structure, Newton County, Indiana	40°45'N 87°25'W	F-18 G-20	024/032	1088-16050 Oct. 19 1972	13	300	Sed	7	C
Decaturville Disturbance Camden County, Missouri	37°54'N 92°43'W	G-20	027/034	1073-16224 Oct. 4, 1972	6	<300	Sed (Cry)	6	C
Flynn Creek structure, Jackson County, Tennessee	36°16'N 85°37'W	G-20 G-21	022/035	1086-15544 Oct. 17, 1972	3.8	360±20	Sed	3	C

*UNC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.
Largest crater in a field of 3 craters.

U.S.A.
Barringer Crater
(Alternate names: Canyon Diablo,
Nininger Crater, Meteor Crater,
Coon Mtn., Coon Butte)
Coconino County, Arizona

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Marquette County, Wisconsin

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USA
Kentland Structure
Newton County, Indiana

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Manson Structure,
Calhoun County, Iowa

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Bell County, Kentucky

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McKenzie County, North Dakota

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Adams County, Ohio

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Sierra Madera Structure,
Pecos County, Texas

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Upheaval Dome,
San Juan County, Utah

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Wells Creek Structure,
Stewart County, Tennessee

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Uvalde
(Alternate name: Bee Bluff)
Zavala County, Texas

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Table 2a. North America: Impact Structures (in alphabetical order)
Canada

Name	Geographic coordinates	UNC*	Landsat Path/Row	Landsat ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Tables 1 and 2)	Target Rock	Pres.	Morph.
<u>Probable impact craters and astroblemes</u>									
Brent Crater, Nipissing County, Ontario	46°05'N 78°29'W	F-18	019/028	1443-15325 Oct. 9, 1973	3.8	450±30	Cry	4	S
Carswell Lake structure, Saskatchewan	58°27'N 109°30'W	D-13	044/019	1684-17472 June 7, 1974	37	485±50	Sed&Cry	7	C
Clearwater Lakes, Quebec	56°10'N 74°20'W	D-15 E-18	020/021	1156-15374 Dec. 26, 1972	22 32	290±20 290±20	(Sed)Cry (Sed)Cry	4 5	C Cr
Deep Bay, Reindeer Lake, Saskatchewan	56°24'N 102°59'W	D-13	039/021	1859-17133 Nov. 29, 1974	12	100±50	Cry	3	C
Gow Lake, Saskatchewan	56°27'N 104°29'W	D-13 E-17	041/021	1825-17262 Oct. 26, 1974	5	<200	Cry	6	C
Haughton Dome, Devon Island, District of Franklin Northwest Territories	75°22'N 89°40'W	B-7	045/007	1253-17555 April 2, 1973	20	15	Sed(Cry)	2	C
Holleford Crater, Lanark County, Ontario	44°28'N 76°38'W	F-19	017/029	1027-15231 Aug. 19, 1972	2	550±100	Sed(Cry)	4	S
Ile Rouleau, Quebec	50°41'N 73°53'W	E-18	017/025	2095-15102 April 27, 1975	4	<300	Sed	6	C
Lac Couture, Quebec	60°08'N 75°18'W	D-14	023/018	1717-15452 July 10, 1974	8	420	Cry	6	C
Lac La Moinerie, Quebec	57°26'N 66°36'W	D-15	014/020	1384-15020 Aug. 11, 1973	8	400	Cry	7	C

Table 2a (Continued)

Manicouagan-Mushalagan, Lakes area, Quebec	51°23'N 68°42'W	E-18 E-19	014/024	1438-15024 Oct. 4, 1973	70	210±4	(Sed)Cry	5	Cr
Mistastin Lake, Labrador, Newfoundland	55°53'N 63°18'W	E-19	011/021	1183-14455 Jan. 22, 1973	28	38±4	Cry	6	C
New Quebec Crater, Alternate names: Chubb Crater, Ungava Crater, Ungava, Quebec	61°17'N 73°40'W	D-15	021/017	2081-15300 April 13, 1975	3.2	5	Cry	3	S
Charlevoix Structure, Alternate names: La Malbaie, Quebec	47°32'N 70°18'W	F-19	014/027	1060-15051 Sept. 21, 1972	46	360±25	(Sed)Cry	6	C
Nicholson Lake, District of Keewatin, Northwest Territories	62°40'N 102°41'W	D-13	043/016	1359-17471 July 17, 1973	12.5	<450	(Sed)Cry	6	C
Pilot Lake, District of Mackenzie, Northwest Territories	60°17'N 111°01'W	D-13	047/018	1345-18110 July 3, 1973	6	<300	Cry	6	C?
St. Martin, Manitoba	51°47'N 98°33'W	E-17	034/024	1728-16503 July 21, 1974	23	225±40	Sed&Cry	4	C
Slate Islands, Ontario	48°40'N 87°00'W	E-17 E-18	026/026	2572-15541 Aug. 16, 1976	30	350	(Sed)Cry	6	C
Steen River structure, Alberta	59°31'N 117°38'W								
Sudbury Basin, Ontario	46°36'N 81°11'W	F-18	021/028	1265-15465 April 14, 1973	140	1,840±150	Cry	6	C
Manapitei Lake, Ontario	46°44'N 80°44'W	F-18	021/028	1265-15465 April 14, 1973	8.5	37±2	Cry	5	C
West Hawk Lake, Manitoba	49°46'N 95°11'W	E-17	032/025	1438-16462 Oct. 4, 1973	2.7	100±50	Cry	4	S

Table 2a (Continued)

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

Table 2b. North America: Impact Structures (in order of increasing latitude)
Canada

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Tables 1 and 2)	Target Rock	Pres. Morph.
<u>Probable impact craters and astroblemes</u>								
Holleford Crater, Lanark County, Ontario	44°28'N 76°38'W	F-19	017/029	1027-15231 Aug. 19, 1972	2	550±100	Sed(Cry)	4 S
Brent Crater, Nipissing County, Ontario	46°05'N 78°29'W	F-18	019/028	1443-15325 Oct. 9, 1973	3.8	450±30	Cry	4 S
Sudbury Basin, Ontario	46°36'N 81°11'W	F-18	021/028	1265-15465 April 14, 1973	140	1,840±150	Cry	6 C
Manapitui Lake, Ontario	46°44'N 80°44'W	F-18	021/028	1265-15465 April 14, 1973	8.5	37±2	Cry	5 C
Charlevoix Structure Alternate names: La Malbale, Quebec	47°32'N 70°18'W	F-19	014/027	1060-15051 Sept. 21, 1972	46	360±25	(Sed)Cry	6 C
Slate Islands, Ontario	48°40'N 87°00'W	E-17 E-18	026/026	2572-15541 Aug. 16, 1976	30	350	(Sed)Cry	6 C
West Hawk Lake, Manitoba	49°46'N 95°11'W	E-17	032/025	1438-16462 Oct. 4, 1973	2.7	100±50	Cry	4 S
Ile Rouleau, Quebec	50°41'N 73°53'W	E-18	017/025	2095-15102 April 27, 1975	4	<300	Sed	6 C
Manicouagan-Mushalagan, Lakes area, Quebec	51°23'N 68°42'W	E-18 E-19	014/024	1438-15024 Oct. 4, 1973	70	210±4	(Sed)Cry	5 Cr
St. Martin, Manitoba	51°47'N 98°33'W	E-17	034/024	1728-16503 July 21, 1974	23	225±40	Sed&Cry	4 C

Table 2b (Continued)

Mistastin Lake, Labrador, Newfoundland	55°53'N 63°18'W	E-19	011/021	1183-14455 Jan. 22, 1973	28	38±4	Cry	5	C
Clearwater Lakes, Quebec	56°10'N 74°20'W	D-15 E-18	020/021	1156-15374 Dec. 26, 1972	22 32	290±20 290±20	(Sed)Cry (Sed)Cry	4 5	C Cr
Deep Bay, Reindeer Lake, Saskatchewan	56°24'N 102°59'W	D-13	039/021	1859-17133 Nov. 29, 1974	12	100±50	Cry	3	C
Gow Lake, Saskatchewan	56°27'N 104°29'W	D-13 E-17	041/021	1825-17262 Oct. 26, 1974	5	<200	Cry	6	C
Lac La Moinerie, Quebec	57°26'N 66°36'W	D-15	014/020	1384-15020 Aug. 11, 1973	8	400	Cry	7	C
Carswell Lake structure, Saskatchewan	58°27'N 109°30'W	D-13	044/019	1684-17472 June 7, 1974	37	485±50	Sed&Cry	7	C
Steen River structure, Alberta	59°31'N 117°38'W								
Lac Couture, Quebec	60°08'N 75°18'W	D-14	023/018	1717-15452 July 10, 1974	8	420	Cry	6	C
Pilot Lake, District of Mackenzie, Northwest Territories	60°17'N 111°01'W	D-13	047/018	1345-18110 July 3, 1973	6	<300	Cry	6	C?
New Quebec Crater, Alternate names: Chubb Crater, Ungava Crater, Ungava, Quebec	61°17'N 73°40'W	D-15	021/017	2081-15300 April 13, 1975	3.2	5	Cry	3	S
Nicholson Lake, District of Keewatin, Northwest Territories	62°40'N 102°41'W	D-13	043/016	1359-17471 July 17, 1973	12.5	<450	(Sed)Cry	6	C
Haughton Dome, Devon Island, District of Franklin Northwest Territories	75°22'N 89°40'W	B-7	045/007	1253-17555 April 2, 1973	20	15	Sed(Cry)	2	C

Table 2b (Continued)

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

Table 2c. North America: Impact Structures (in order of decreasing diameter)
Canada

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Probable impact craters and astroblemes</u>									
Sudbury Basin, Ontario	46°36'N 81°11'W	F-18	021/028	1265-15465 April 14, 1973	140	1,840±150	Cry	6	C
Manicouagan-Mushalagan, Lakes area, Quebec	51°23'N 68°42'W	E-18 E-19	014/024	1438-15024 Oct. 4, 1973	70	210±4	(Sed)Cry	5	Cr
Charlevoix Structure Alternate names: La Malbaie, Quebec	47°32'N 70°18'W	F-19	014/027	1060-15051 Sept. 21, 1972	46	360±25	(Sed)Cry	6	C
Carswell Lake structure, Saskatchewan	58°27'N 109°30'W	D-13	044/019	1684-17472 June 7, 1974	37	485±50	Sed&Cry	7	C
Slate Islands, Ontario	48°40'N 87°00'W	E-17 E-18	026/026	2572-15541 Aug. 16, 1976	30	350	(Sed)Cry	6	C
Mistastin Lake, Labrador, Newfoundland	55°53'N 63°18'W	E-19	011/021	1183-14455 Jan. 22, 1973	28	38±4	Cry	6	C
St. Martin, Manitoba	51°47'N 98°33'W	E-17	034/024	1728-16503 July 21, 1974	23	225±40	Sed&Cry	4	C
Clearwater Lakes, Quebec	56°10'N 74°20'W	D-15 E-18	020/021	1156-15374 Dec. 26, 1972	22 32	290±20 290±20	(Sed)Cry (Sed)Cry	4 5	C Cr
Haughton Dome, Devon Island, District of Franklin Northwest Territories	75°22'N 89°40'W	B-7	045/007	1253-17555 April 2, 1973	20	15	Sed(Cry)	2	C

Table 2c (Continued)

Nicholson Lake, District of Keewatin, Northwest Territories	62°40'N 102°41'W	D-13	043/016	1359-17471 July 17, 1973	12.5	<450	(Sed)Cry	6	C
Deep Bay, Reindeer Lake, Saskatchewan	56°24'N 102°59'W	D-13	039/021	1859-17133 Nov. 29, 1974	12	100±50	Cry	3	C
Manapitei Lake, Ontario	46°44'N 80°44'W	F-18	021/028	1265-15465 April 14, 1973	8.5	37±2	Cry	5	C
Lac Couture, Quebec	60°08'N 75°18'W	D-14	023/018	1717-15452 July 10, 1974	8	420	Cry	6	C
Lac La Moirerie, Quebec	57°26'N 66°36'W	D-15	014/020	1384-15020 Aug. 11, 1973	8	400	Cry	7	C
Pilot Lake, District of Mackenzie, Northwest Territories	60°17'N 111°01'W	D-13	047/018	1345-18110 July 3, 1973	6	<300	Cry	6	C?
Gow Lake, Saskatchewan	56°27'N 104°29'W	D-13 E-17	041/021	1825-17262 Oct. 26, 1974	5	<200	Cry	6	C
Ile Rouleau, Quebec	50°41'N 73°53'W	E-18	017/025	2095-15102 April 27, 1975	4	<300	Sed	6	C
Brent Crater, Nipissing County, Ontario	46°05'N 78°29'W	F-18	019/028	1443-15325 Oct. 9, 1973	3.8	450±30	Cry	4	S
New Quebec Crater, Alternate names: Chubb Crater, Ungava Crater, Ungava, Quebec	61°17'N 73°40'W	D-15	021/017	2081-15300 April 13, 1975	3.2	5	Cry	3	S
West Hawk Lake, Manitoba	49°46'N 95°11'W	E-17	032/025	1438-16462 Oct. 4, 1973	2.7	100±50	Cry	4	S
Holleford Crater, Lanark County, Ontario	44°28'N 76°38'W	F-19	017/029	1027-15231 Aug. 19, 1972	2	550±100	Sed(Cry)	4	S

Table 2c (Continued)

Steen River structure,
Alberta 59°31'N
117°38'W

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

Table 2d. North America: Impact Structures (in order of increasing geologic age)
Canada

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres. Morph.
Probable impact craters and astroblemes detectable on Landsat MSS images								
New Quebec Crater, Alternate names: Chubb Crater, Ungava Crater, Ungava, Quebec	61°17'N 73°40'W	D-15	021/017	2081-15300 April 13, 1975	3.2	5	Cry	3 S
Haughton Dome, Devon Island, District of Franklin Northwest Territories	75°22'N 89°40'W	B-7	045/007	1253-17555 April 2, 1973	20	15	Sed(Cry)	2 C
Manapitei Lake, Ontario	46°44'N 80°44'W	F-18	021/028	1265-15465 April 14, 1973	8.5	37±2	Cry	5 C
Mistastin Lake, Labrador, Newfoundland	55°53'N 63°18'W	E-19	011/021	1183-14455 Jan. 22, 1973	28	38±4	Cry	6 C
West Hawk Lake, Manitoba	49°46'N 95°11'W	E-17	032/025	1438-16462 Oct. 4, 1973	2.7	100±50	Cry	4 S
Deep Bay, Reindeer Lake, Saskatchewan	56°24'N 102°59'W	D-13	039/021	1859-17133 Nov. 29, 1974	12	100±50	Cry	3 C
Gow Lake, Saskatchewan	56°27'N 104°29'W	D-13 E-17	041/021	1825-17262 Oct. 26, 1974	5	<200	Cry	6 C
Manicouagan-Mushalagan, Lakes area, Quebec	51°23'N 68°42'W	E-18 E-19	014/024	1438-15024 Oct. 4, 1973	70	210±4	(Sed)Cry	5 Cr
Clearwater Lakes, Quebec	56°10'N 74°20'W	D-15 E-18	020/021	1156-15374 Dec. 26, 1972	22 32	290±20 290±20	(Sed)Cry (Sed)Cry	4 C 5 Cr
Ile Rouleau, Quebec	50°41'N 73°53'W	E-18	017/025	2095-15102 April 27, 1975	4	<300	Sed	6 C

Table 2d (Continued)

Pilot Lake, District of Mackenzie, Northwest Territories	60°17'N 111°01'W	D-13	047/018	1345-18110 July 3, 1973	6	<300	Cry	6	C?
Slate Islands, Ontario	48°40'N 87°00'W	E-17 E-18	026/026	2572-15541 Aug. 16, 1976	30	350	(Sed)Cry	6	C
Lac La Minerie, Quebec	57°26'N 66°36'W	D-15	014/020	1384-15020 Aug. 11, 1973	8	400	Cry	7	C
Lac Couture, Quebec	60°08'N 75°18'W	D-14	023/018	1717-15452 July 10, 1974	8	420	Cry	6	C
Nicholson Lake, District of Keewatin, Northwest Territories	62°40'N 102°41'W	D-13	043/016	1359-17471 July 17, 1973	12.5	<450	(Sed)Cry	6	C
Sudbury Basin, Ontario	46°36'N 81°11'W	F-18	021/028	1265-15465 April 14, 1973	140	1,840±150	Cry	6	C
St. Martin, Manitoba	51°47'N 98°33'W	E-17	034/024	1728-16503 July 21, 1974	23	225±40	Sed&Cry	4	C
Charlevoix Structure, Alternate names: La Malbaie, Quebec	47°32'N 70°18'W	F-19	014/027	1060-15051 Sept. 21, 1972	46	360±25	(Sed)Cry	6	C
Brent Crater, Nipissing County, Ontario	46°05'N 78°29'W	F-18	019/028	1443-15325 Oct. 9, 1973	3.8	450±30	Cry	4	S
Probable impact craters and astroblemes not detectable on Landsat MSS images									
Carswell Lake structure, Saskatchewan	58°27'N 109°30'W	D-13	044/019	1684-17472 June 7, 1974	37	485±50	Sed&Cry	7	C
Holleford Crater, Lanark County, Ontario	44°28'N 76°38'W	F-19	017/029	1027-15231 Aug. 19, 1972	2	550±100	Sed(Cry)	4	S
Steen River structure, Alberta	59°31'N 117°38'W								

Table 2d (Continued)

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

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Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

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Nipissing County, Algonquin Park,
Ontario

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Alternate name: La Malbaie
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New Quebec Crater,
Alternate names: Chubb Crater,
Ungava Crater
Ungava Peninsula, Quebec

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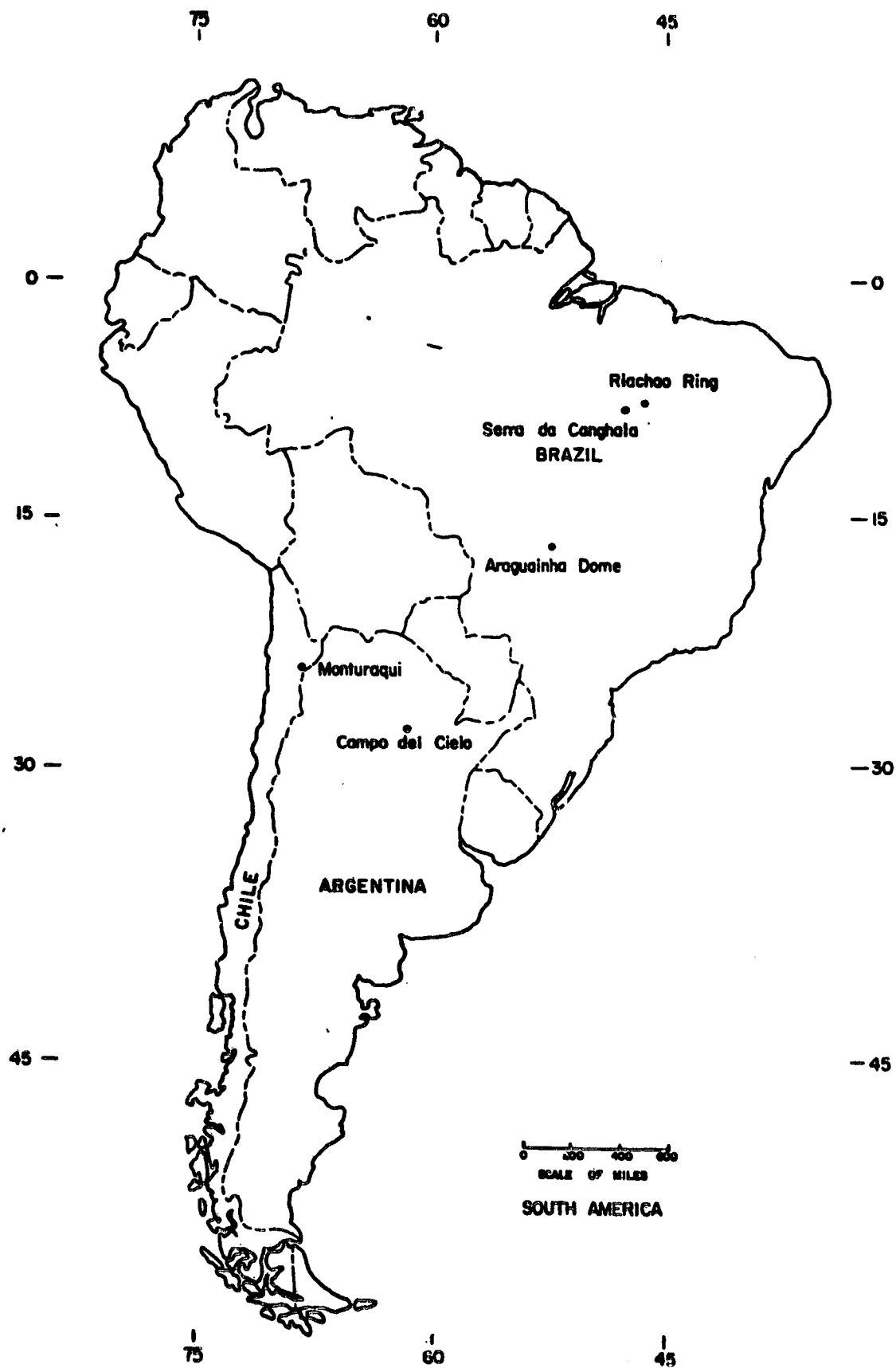


Table 3a. South America: Impact Structures (in alphabetical order)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Proven impact craters</u>									
Campo del Cielo Craters, Chaco, Argentina	27°38'S 61°42'W	Q-27	244/079	1687-13194 June 10, 1974	0.09*				
			245/079	1040-13320 Sept. 1, 1972					
<u>Probable impact craters and astroblemes</u>									
Araguainha Dome, Mato Grosso-Goiás, Brazil	16°46'S 52°59'W	N-27 P-27	241/072	1089-13005 Oct. 20, 1972	40	<250	Sed&Cry	6	Cr
Monturaqui Crater, Antofagasta, Chile	23°56'S 68°17'W	P-26	250/077	1099-14003 Oct. 30, 1972	0.46	1	Cry	2	S
Riachao Ring, Maranhao, Brazil	07°43'S 46°39'W	M-27 N-27	237/066	1374-12404 Aug. 1, 1973	4	?	Sed	4	C
Serra da Cangahala, Goiás, Brazil	08°05'S 46°52'W	M-27 N-27	237/066	1374-12404 Aug. 1, 1973	12	<300	Sed	7	C

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form. Largest crater in a field of 20 craters.

Table 3b. South America: Impact Structures (in order of increasing latitude)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Proven impact craters</u>									
Campo del Cielo Craters, Chaco, Argentina	27°38'S 61°42'W	Q-27	244/079	1387-13194 June 10, 1974	0.09"				
			245/079	1040-13320 Sept. 1, 1972					
<u>Probable impact craters and astroblemes</u>									
Riachao Ring, Maranhao, Brazil	07°43'S 46°39'W	M-27 N-27	237/066	1374-12404 Aug. 1, 1973	4	?	Sed	4	C
Serra da Canghala, Goias, Brazil	08°05'S 46°52'W	M-27 N-27	237/066	1374-12404 Aug. 1, 1973	12	<300	Sed	7	C
Araguainha Dome, Matto Grosso-Goias, Brazil	16°46'S 52°59'W	M-27 P-27	241/072	1089-12305 Oct. 20, 1972	40	<250	Sed&Cry	6	Cr
Monturaqui Crater, Antofagasta, Chile	23°56'S 68°17'W	P-26	250/077	1099-14003 Oct. 30, 1972	0.46	1	Cry	2	S

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form. Largest crater in a field of 20 craters.

Table 3c. South America: Impact Structures (in order of decreasing diameter)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Tables 1 and 2)	Target Rock	Pres.	Morph.
<u>Proven impact craters</u>									
Campo del Cielo Craters, Chaco, Argentina	27°38'S	Q-27	244/079	1687-13194 June 10, 1974	0.09*				
	61°42'W		245/079	1040-13320 Sept. 1, 1972					
<u>Probable impact craters and astroblemes</u>									
Araguainha Dome, Matto Grosso-Goiás, Brazil	16°46'S	N-27	241/072	1089-13005 Oct. 20, 1972	40	<250	Sed&Cry	6	Cr
	52°59'W	P-27							
Serra da Canghala, Goiás, Brazil	08°05'S	M-27	237/066	1374-12404 Aug. 1, 1973	12	<300	Sed	7	C
	46°52'W	N-27							
Riachao Ring, Maranhao, Brazil	07°43'S	M-27	237/066	1374-12404 Aug. 1, 1973	4	?	Sed	4	C
	46°39'W	N-27							
Monturaqui Crater, Antofagasta, Chile	23°56'S	P-26	250/077	1099-14003 Oct. 30, 1972	0.46	1	Cry	2	S
	68°17'W								

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form. Largest crater in a field of 20 craters.

Table 3d. South America: Impact Structures (in order of increasing geologic age)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Probable impact craters and astrophysical problems detectable on Landsat MSS images</u>									
Araguaína Dome, Mato Grosso-Goiás, Brazil	16°46'S 52°59'W	M-27 P-27	241/072	1089-13005 Oct. 20, 1972	40	<250	Sed&Cry	6	Cr
Serra da Cangahala, Goiás, Brazil	08°05'S 46°52'W	M-27 N-27	237/066	1374-12404 Aug. 1, 1973	12	<300	Sed	7	C
Riachão Ring, Maranhão, Brazil	07°43'S 46°39'W	M-27 N-27	237/066	1374-12404 Aug. 1, 1973	4	?	Sed	4	C
<u>Probable impact crater barely detectable on Landsat MSS images</u>									
Monturaquí Crater, Antofagasta, Chile	23°56'S 68°17'W	P-26	250/077	1099-14003 Oct. 30, 1972	0.46	1	Cry	2	S
<u>Proven impact craters not detectable on Landsat MSS images</u>									
Campo del Cielo Craters, Chaco, Argentina	27°38'S 61°42'W	Q-27	244/079 245/079	1687-13194 June 10, 1974 1040-13320 Sept. 1, 1972	0.09*				

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.
Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.
Largest crater in a field of 20 craters.

South America
Argentina, Gran Chaco Gualamba
Campo del Cielo Craters

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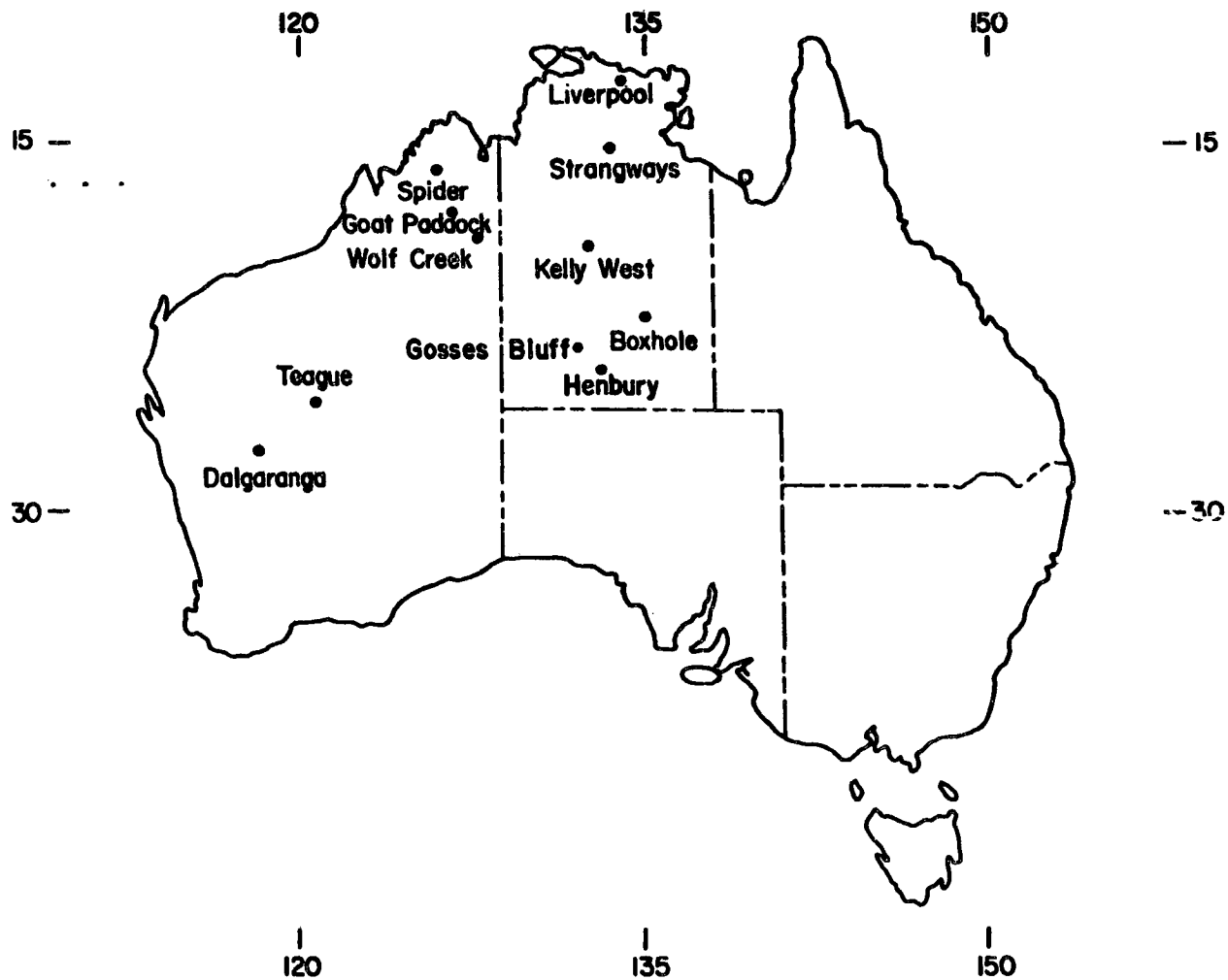
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Table 4a. Australia: Impact Structures (in alphabetical order)

Name	Geographic coordinates	ONC	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Proven meteorite impact craters</u>									
Boxhole Crater, Northern Territory	22°37'S 135°12'E	P-13	108/076	1011-00244 Aug. 3, 1972	0.185				
Dalgaranga Crater, Western Australia	27°43'S 117°05'E	O-12	120/079	31572-01270 June 24, 1982	0.021				
Henbury Craters, Northern Territory	24°34'S 133°10'E	Q-13	109/077	1408-00303 Sept. 4, 1973	0.150*				
Wolf Creek Crater, Western Australia	19°10'S 127°48'E	P-13	114/073	1125-00585 Nov. 25, 1972	0.850				
<u>Probable impact craters and astroblemes</u>									
Goat Paddock, Western Australia	18°20'S 126°40'E	P-13	115/073	1414-01030 Sept. 10, 1973	5	<50	Sed	3	C
Gosses Bluff, Northern Territory	23°50'S 132°18'E	P-13 Q-13	110/077	1247-00375 Mar. 27, 1973	22	130±6	Sed	6	C
Kelly West ¹ , Northern Territory	19°57'S 133°56'E	P-13	110/074	1085-00354 Oct. 16, 1972	2.5	<550	Sed	7	?
Liverpool, Northern Territory	12°24'S 134°03'E	N-13 N-14	111/069	30003-30027 Apr. 7, 1978	1.6	150±70	Sed	3	S
Spider, Western Australia	16°30'S 126°00'E	P-13	115/072	1378-01031 Aug. 15, 1973	5	?	Sed	7	C
Strangways, Northern Territory	15°12'S 133°35'E	N-13, N-14 P-13	111/070	2370-00255 Jan. 27, 1976	24	<600	Sed (Cry)	5	C

Table 4a (Continued)

League Western Australia	25°50'S 120°55'E	0-12	118/078	1561-01191 Feb. 4, 1974	28	<1.685±5	Sed&Cry	7	5
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*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

*Diameter of largest crater in a field of 14 craters.
1-Location of Kelly West matches published geographic description (Tonkin, 1973).

Table 4b. Australia: Impact Structures (in order of increasing latitude)

Name	¹ Geographic coordinates	ONC*	Landsat Path/Row	Landsat ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Tables 1 and 2)	Target Rock	Pres.	Morph.
<u>Proven meteorite impact craters</u>									
Wolf Creek Crater, Western Australia	19°10'S 127°48'E	P-13	114/073	1125-00585 Nov. 25, 1972	0.850				
Boxhole Crater, Northern Territory	22°37'S 135°12'E	P-13	108/076	1011-00244 Aug. 3, 1972	0.185				
Henbury Craters, Northern Territory	24°34'S 133°10'E	Q-13	109/077	1408-00303 Sept. 4, 1973	0.150*				
Dalgaranga Crater, Western Australia	27°43'S 117°05'E	O-12	120/079	31572-01270 June 24, 1982	0.021				
<u>Probable impact craters and astroblemes</u>									
Liverpool, Northern Territory	12°24'S 134°03'E	N-13 N-14	111/069	30003-30027 Apr. 7, 1978	1.6	150±70	Sed	3	S
Strangways, Northern Territory	15°12'S 123°35'E	N-13, N-14 P-13?	111/070	2370-00255 Jan. 27, 1976	24	<600	Sed (Cry)	5	C
Spider, Western Australia	16°30'S 126°00'E	P-13	115/072	1378-01031 Aug. 15, 1973	5	?	Sed	7	C
Goat Paddock, Western Australia	18°20'S 126°40'E	P-13	115/073	1414-01030 Sept. 10, 1973	5	<50	Sed	3	C
Kelly West ¹ , Northern Territory	19°57'S 133°56'E	P-13	110/074	1085-00354 Oct. 16, 1972	2.5	<550	Sed	7	?
Gosses Bluff, Northern Territory	23°50'S 132°18'E	P-13 Q-13	110/077	1247-00375 Mar. 27, 1973	22	130±6	Sed	6	C

Table 4b (Continued)

Teague Western Australia	25°50'S 120°55'E	0-12	118/078	1561-01191 Feb. 4, 1974	28	<1.685±5	Sed&Cry	7	C
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*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

*Diameter of largest crater in a field of 14 craters.
†Location of Kelly West matches published geographic description (Tonkin, 1973).

Table 4c. Australia: Impact Structures (in order of decreasing diameter)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Tables 1 and 2)	Target Rock	Pres.	Morph.
<u>Proven meteorite impact craters</u>									
Wolf Creek Crater, Western Australia	19°10'S 127°48'E	P-13	114/073	1125-00585 Nov. 25, 1972	0.850				
Boxhole Crater, Northern Territory	22°37'S 135°12'E	P-13	108/076	1011-00244 Aug. 3, 1972	0.185				
Henbury Craters, Northern Territory	24°34'S 133°10'E	Q-13	109/077	1408-00303 Sept. 4, 1973	0.150*				
Dalgaranga Crater, Western Australia	27°43'S 117°05'E	O-12	120/079	31572-01270 June 24, 1982	0.021				
<u>Probable impact craters and astroblemes</u>									
Teague, Western Australia	25°50'S 120°55'E	O-12	118/078	1561-01191 Feb. 4, 1974	28	<1,685±5	Sed&Cry	7	C
Strangways, Northern Territory	15°12'S 133°35'E	N-13, N-14 P-13	111/070	2370-00255 Jan. 27, 1976	24	<600	Sed(Cry)	5	C
Gosses Bluff, Northern Territory	23°50'S 132°18'E	P-13 Q-13	110/077	1247-00375 Mar. 27, 1973	22	130±6	Sed	6	C
Spider, Western Australia	16°30'S 126°00'E	P-13	115/072	1378-01031 Aug. 15, 1973	5	?	Sed	7	C
Goat Paddock, Western Australia	18°20'S 126°40'E	P-13	115/073	1414-01030 Sept. 10, 1973	5	<50	Sed	3	C
Kelly West ¹ , Northern Territory	19°57'S 133°56'E	P-13	110/074	1085-00354 Oct. 16, 1972	2.5	<550	Sed	7	?

Table 4c (Continued)

Liverpool, Northern Territory	12°24'S 134°03'E	N-13 N-14	111/069	30003-30027 Apr. 7, 1978	1.6	150±70	Sed	3	S
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*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring rim.

*Diameter of largest crater in a field of 14 craters.

†Location of Kelly West matches published geographic description (Tonkin, 1973).

Table 4d. Australia: Impact Structures (in order of increasing geologic age)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Proven impact craters detectable on Landsat MSS images</u>									
Wolf Creek Crater, Western Australia	19°10'S 127°48'E	P-13	114/073	1125-00585 Nov. 25, 1972	0.850				
<u>Probable impact craters and astroblemes detectable on Landsat MSS images</u>									
Spider, Western Australia	16°30'S 126°00'E	P-13	115/072	1378-01031 Aug. 15, 1973	5	?	Sed	7	C
Goat Paddock, Western Australia	18°20'S 126°40'E	P-13	115/073	1414-01030 Sept. 10, 1973	5	<50	Sed	3	C
Gosses Bluff, Northern Territory	23°50'S 132°18'E	P-13 Q-13	110/077	1247-00375 Mar. 27, 1973	22	130±6	Sed	6	C
Teague, Western Australia	25°50'S 120°55'E	O-12	118/078	1561-01191 Feb. 4, 1974	28	<1.685±5	Sed&Cry	7	C
<u>Proven impact crater barely detectable on Landsat MSS images</u>									
Boxhole Crater, Northern Territory	22°37'S 135°12'E	P-13	108/076	1011-00244 Aug. 3, 1972	0.185				
<u>Probable impact craters and astroblemes barely detectable on Landsat MSS images</u>									
Liverpool, Northern Territory	12°24'S 134°03'E	N-13 N-14	111/069	3003-30027 Apr. 7, 1978	1.6	150±70	Sed	3	S
Kelly West ¹ , Northern Territory	19°57'S 133°56'E	P-13	110/074	1085-00354 Oct. 16, 1972	2.5	<550	Sed	7	?
Strangways, Northern Territory	15°12'S 133°35'E	N-13, N-14 P-13	111/070	2370-00255 Jan. 27, 1976	24	<600	Sed (Cry)	5	C

Table 4d (Continued)

Proven impact craters not detectable on Landsat MSS images				
Henbury Craters, Northern Territory	24°34'S 133°10'E	Q-13	109/077	1408-00303 Sept. 4, 1973
				0.150*
Dalgaranga Crater Western Australia	27°43'S 117°05'E	0-12	120/079	31572-01270 June 24, 1982
				0.021

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

*Diameter of largest crater in a field of 14 craters.
Location of Kelly West matches published geographic description (Tonkin, 1973).

Australia
Northern Territory
Boxhole Crater

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Strangways

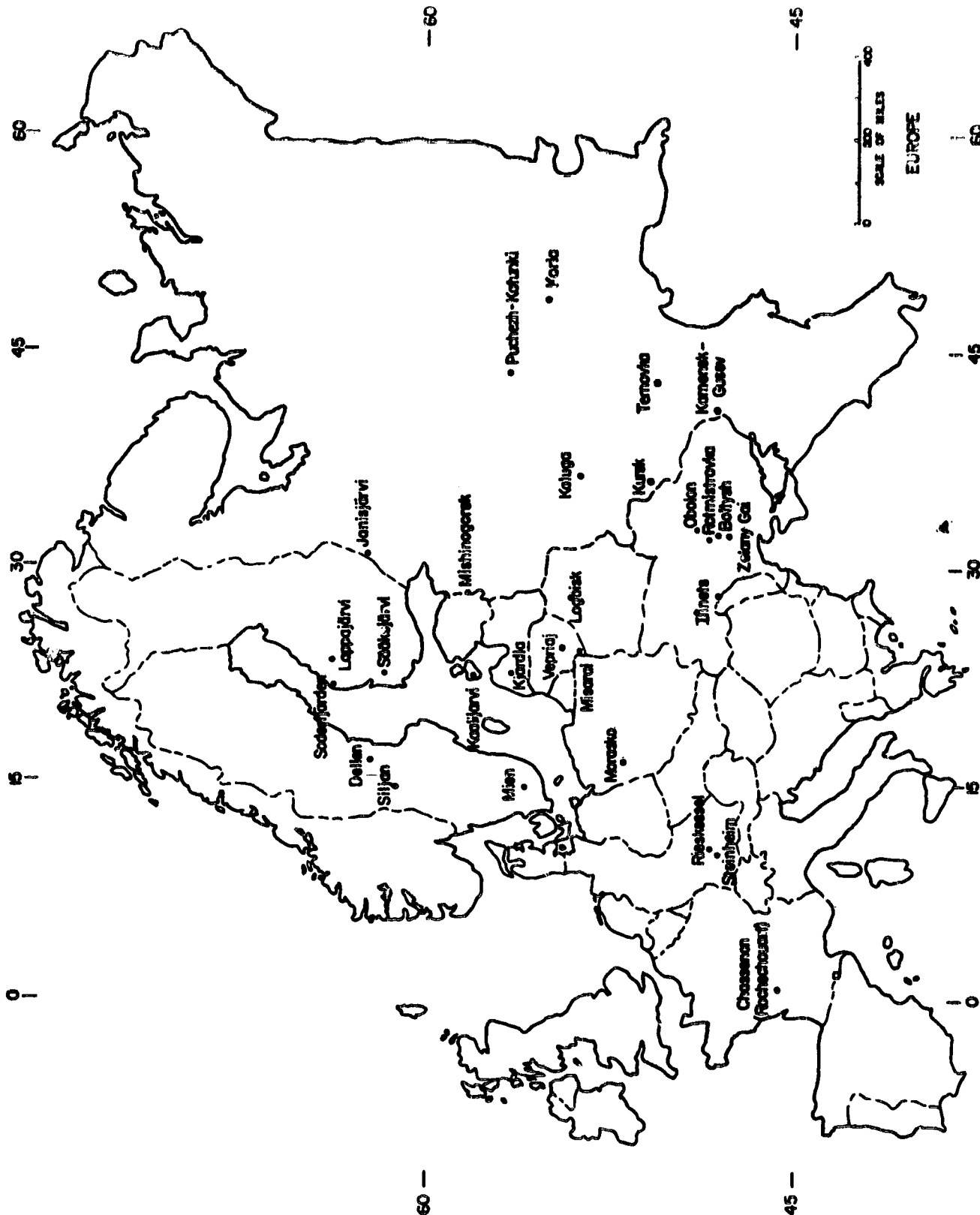
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Table 5a. Europe: Impact Structures (in alphabetical order)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Proven impact craters</u>									
Kaaliyar Craters, Estonian SSR, U.S.S.R.	58°24'N 22°40'E	D-3	204/019	2103-09084 May 5, 1975	0.11*				
Morasko Craters, Poland	52°29'N 16°54'E	E-3	205/023	2104-09080 May 6, 1975	0.1*				
<u>Probable impact craters and astroblemes</u>									
Boltysh, Ukrainian SSR, U.S.S.R.	48°45'N 32°10'E	E-3	191/027	2108-07491 May 10, 1975	25	100±5	Cry	4	C
Chassenon Crater, (Alternate name: Rochechouart), France	45°49'N 0°46'E	F-1	214/028	1243-10141 Mar. 23, 1973	23	160±5	Cry	6	C
Il'inets, Ukrainian SSR, U.S.S.R.	48°55'N 28°54'E	E-3	196/026	2959-07523 Sept. 7, 1977	4.5	495±5	Cry	5	C
Kaluga, Russian SFSR, U.S.S.R.	54°30'N 36°15'E	E-4	193/022	2254-07573 Oct. 3, 1975	15	360±10	Sed3Cry	4	C
Kamensk-Gusev, Russian SFSR, U.S.S.R.	48°16'N 40°18'E	F-4	188/026	2573-07234 Aug. 17, 1976	25	65	Sed	5	C
Karla, Tatar SSR, U.S.S.R.	55°00'N 48°20'E	E-4	185/021	2138-07123 June 9, 1975	10	10	Sed	4	C
Kjardla, Latvian SSR, U.S.S.R.	57°00'N 22°42'E	D-2	203/020	2606-08461 Sept. 19, 1976	4	500±50	Sed?	?	?
Kursk, Russian SFSR, U.S.S.R.	51°40'N 36°00'E	E-4	192/024	2793-07373 Mar. 25, 1977	5	250±30	Sed3Cry	5	C

Table 5a (Continued)

Lake Dellen, Sweden	61°54'N 16°40'E	D-2	209/017	1202-09403 Feb. 10, 1973	15	230	Cry	6	C
Lake Janis'yarvi, Karelian SSR, U.S.S.R.	61°58'N 30°57'E	D-3	201/016	1662-08473 May 6, 1974	14	700	Cry	6	C
Lake Lappajarvi, Finland	63°09'N 23°42'E	D-3	205/016	1216-09172 Feb. 24, 1973	14	77±4	Cry	6	C
Lake Nien, Sweden	56°25'N 14°55'E	D-2 E-2	209/021	2036-09303 Feb. 27, 1975	5	118±2	Cry	6	C
Lake Säcksjärvi, Finland	61°24'N 22°22'E	D-3	205/017	2104-09053 May 6, 1975	5	490	Cry	7	?
Lake Siiljan, Sweden	61°02'N 14°52'E	D-2	211/017	1330-09514 June 18, 1973	52	365±7	Sed&Cry	7	C
Lugovsk, Byelorussian SSR, U.S.S.R.	54°12'N 27°48'E	E-3	198/022	2475-08220 May 11, 1976	17	100±20	Sed?	?	?
Misarai, Lithuanian SSR, U.S.S.R.	54°00'N 23°54'E	E-3	202/022	2155-08503 June 26, 1975	5	500±80	Sed?	?	?
Mishinogorsk, RSFSR, U.S.S.R.	58°35'N 23°07'E	D-3	201/019	2160-08382 Apr. 26, 1976	9	<360	Sed(Cry)	5	C
Uhoion, Ukrainian SSR, U.S.S.R.	49°30'N 32°55'E	E-3	191/027	2108-07491 May 10, 1975	15	160	Cry	5	C
Puchezh-Katunki Crater, RSFSR, U.S.S.R.	56°56'N 43°42'E	D-3 D-4	188/020	2105-07291 May 7, 1975	80	183±3	Sed&Cry	4	Cr
Rieskessel, Germany	48°53'N 10°37'E	E-2 F-2	208/026	1309-09383 May 28, 1973	24	14.8±0.7	Sed&Cry	2	Cr
Rotmistrovka Ukrainian SSR, U.S.S.R.	49°00'N 32°00'E	E-3	193/026	2074-08003 April 6, 1975	5	70	Cry	4	S
Soderfjärden, Finland	63°02'N 21°35'E	D-3	207/016	1038-09275 Aug. 30, 1972	5.5	600	Cry	5	C

Table 5a (Continued)

Steinheim Basin, Germany	48°41'N 10°04'E	E-2 F-2	208/026	1309-09383 May 28, 1973	3.4	14.8±0.7	Sed	3	?
Ternovka, U.S.S.R.	51°19'N 42°58'E	F-4	187/024	2608-07160 Sept. 21, 1976	6	?	Sed	?	?
Vepriaj, Lithuanian SSR, U.S.S.R.	55°06'N 24°36'E	E-3	202/021	2199-08254 May 5, 1978	8	160±30	Sed	?	?
Zeleny Gai Ukrainian SSR, U.S.S.R.	48°07'N 32°09'E	E-3	191/027	2108-07491 May 10, 1975	1.4	120±20	?	?	S

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

1-largest crater in field of 7 craters

Geographic coordinates of USSR impact structures, adjusted to match the approximate centers of large structures (Puchezh-Katunki, Mishinogorsk), or to conform to scant geographic descriptions in the Russian literature (Karla). The geographic coordinates of impact structures occupied by lakes are those of the lake centers.

Table 5b. Europe: Impact Structures (in order of increasing latitude)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Tables 1 and 2)	Target Rock	Pres. Morph.
<u>Proven impact craters</u>								
Morasko Craters, Poland	52°29'N 16°54'E	E-3	205/023	2104-09080 May 6, 1975	0.1*			
Kaalijarvi Craters, Estonian SSR, U.S.S.R.	58°24'N 22°40'E	D-3	204/019	2103-09004 May 5, 1975	0.11*			
<u>Probable impact craters and astroblemes</u>								
Chassenon Crater. (Alternate name: Rochechouart), France	45°49'N 0°46'E	F-1	214/028	1243-10141 Mar. 23, 1973	23	160±5	Cry	6 C
Zeleny Gai Ukrainian SSR, U.S.S.R.	48°07'N 32°09'E	E-3	191/027	2108-07491 May 10, 1975	1.4	120±20	?	? S
Kamensk-Gusev, Russian SFSR, U.S.S.R.	48°16'N 40°18'E	F-4	188/026	2573-07234 Aug. 17, 1976	25	65	Sed	5 C
Steinheim Basin, Germany	48°41'N 10°04'E	E-2 F-2	208/026	1309-09383 May 28, 1973	3.4	14.8±0.7	Sed	3 C
Boltysh, Ukrainian SSR, U.S.S.R.	48°45'N 32°10'E	E-3	191/027	2108-07491 May 10, 1975	25	100±5	Cry	4 C
Rieskessel, Germany	48°53'N 10°37'E	E-2 F-2	208/026	1309-09383 May 28, 1973	24	14.8±0.7	Sed&Cry	2 Cr
Il'ynets, Ukrainian SSR, U.S.S.R.	48°55'N 28°54'E	E-3	196/026	2959-07523 Sept. 7, 1977	4.5	495±5	Cry	5 C
Rotmistrovka Ukrainian SSR, U.S.S.R.	49°00'N 32°00'E	E-3	193/026	2074-08003 April 6, 1975	5	70	Cry	4 S

Table 5b (Continued)

Obolon, Ukrainian SSR, U.S.S.R.	49°30'N 32°55'E	E-3	191/027	2108-07491 May 10, 1975	15	160	Cry	5	C
Ternovka, U.S.S.R.	51°19'N 42°58'E	F-4	187/024	2608-07160 Sept. 21, 1976	6	?	Sed	?	?
Kursk, Russian SFSR, U.S.S.R.	51°40'N 36°00'E	E-4	192/024	2793-07373 Mar. 25, 1977	5	250±80	Sed&Cry	5	C
Misarai, Lithuanian SSR, U.S.S.R.	54°00'N 23°54'E	E-3	202/022	2155-08503 June 26, 1975	5	500±80	Sed?	?	?
Logoisk, Byelorussian SSR, U.S.S.R.	54°12'N 27°48'E	E-3	198/022	2475-08220 May 11, 1976	17	100±20	Sed?	?	?
Kaluga, Russian SFSR, U.S.S.R.	54°30'N 36°15'E	E-4	193/022	2254-07573 Oct. 3, 1975	15	360±10	Sed&Cry	4	C
Karia, Tatar SSR, U.S.S.R.	55°00'N 48°20'E	E-4	185/021	2138-07123 June 9, 1975	10	10	Sed	4	C
Vepriaj, Lithuanian SSR, U.S.S.R.	55°06'N 24°36'E	E-3	202/021	2199-08254 May 5, 1978	8	160±30	Sed	?	?
Lake Mien, Sweden	56°25'N 14°55'E	D-2 E-2	209/021	2036-09303 Feb. 27, 1975	5	118±2	Cry	6	C
Puchezh-Katunki Crater, RSFSR, U.S.S.R.	56°55'N 43°42'E	D-3 D-4	188/020	2105-07291 May 7, 1975	80	183±3	Sed&Cry	4	Cr
Kjardla, Latvian SSR, U.S.S.R.	57°00'N 22°42'E	D-3	203/020	2606-08461 Sept. 19, 1976	4	500±50	Sed?	?	?
Mishinogorsk, RSFSR, U.S.S.R.	58°35'N 28°07'E	D-3	201/019	2460-08382 Apr. 26, 1976	9	<360	Sed (Cry)	5	?
Lake Siljan, Sweden	61°02'N 14°52'E	D-2	211/017	1330-09514 June 18, 1973	52	365±7	Sed&Cry	7	C
Lake Sääksjärvi, Finland	61°24'N 22°22'E	D-3	20°/017	2104-09053 May 6, 1975	5	490	Cry	7	?

Table 5b (Continued)

Lake Dellen, Sweden	61°54'N 16°40'E	D-2	209/017	1202-09403 Feb. 10, 1973	15	230	Cry	6	C
Lake Janis'yarvi, Karelian SSR, U.S.S.R.	61°58'N 30°57'E	D-3	201/016	1662-08473 May 6, 1974	14	700	Cry	6	C
Soderfjärden, Finland	63°02'N 21°35'E	D-3	207/016	1038-09275 Aug. 30, 1972	5.5	600	Cry	5	C
Lake Lappajarvi, Finland	63°09'N 23°42'E	D-3	205/016	1216-09172 Feb. 24, 1973	14	77±4	Cry	6	C

*OWC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.
Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.
Largest crater in field of 7 craters.

Geographic coordinates of USSR impact structures, adjusted to match the approximate centers of large structures (Puchezh-Katunki, Mishinogorsk), or to conform to scant geographic descriptions in the Russian literature (Karla). The geographic coordinates of impact structures occupied by lakes are those of the lake centers.

Table 5c. Europe: Impact Structures (in order of decreasing diameter)

Table 5C. Europe: Impact Structures									
Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Tables 1 and 2)	Target Rock	Pres.	Morph.
<u>Proven impact craters</u>									
Morasko Craters, Poland	52°29'N 16°54'E	E-3	205/023	2104-09080 May 6, 1975	0.1*				
		D-3	204/019	2103-09004 May 5, 1975	0.11*				
<u>Probable impact craters and astroblemes</u>									
Puchezh-Katunki Crater, RSFSR, U.S.S.R.	56°56'N 43°42'E	D-3	188/020	2105-07291 May 7, 1975	80	183±3	Sed&Cry	4	Cr
		D-4							
Lake Siljan, Sweden	61°02'N 14°52'E	D-2	211/017	1330-09514 June 18, 1973	52	365±7	Sed&Cry	7	C
Boltys, Ukrainian SSR, U.S.S.R.	48°45'N 32°10'E	E-3	191/027	2108-07491 May 10, 1975	25	100±5	Cry	4	C
		F-4	188/026	2573-07234 Aug. 17, 1976	25	65	Sed	5	C
Kamensk-Gusev, Russian SFSR, U.S.S.R.	48°16'N 40°18'E	E-2	208/026	1309-09383 May 28, 1973	24	14.8±0.7	Sed&Cry	2	Cr
Rieskessel, Germany	48°53'N 10°37'E	F-2							
Chassenon Crater, (Alternate name: Rochecouart), France	45°49'N 0°46'E	F-1	214/028	1243-10141 Mar. 23, 1973	23	160±5	Cry	6	C
Logosk, Byelorussian SSR, U.S.S.R.	54°12'N 27°48'E	E-3	198/022	2475-08220 May 11, 1976	17	100±20	Sed?	?	?
		E-4	193/022	2254-07573 Oct. 3, 1975	15	360±10	Sed&Cry	4	C
Kaluga, Russian SFSR, U.S.S.R.	54°30'N 36°15'E								

Table 5c (Continued)

Lake Dellen, Sweden	61°54'N 16°40'E	D-2	209/017	1202-09403 Feb. 10, 1973	15	230	Cry	6	C
Obolon, Ukrainian SSR, U.S.S.R.	49°30'N 32°55'E	E-3	191/027	2108-07491 May 10, 1975	15	160	Cry	5	C
Lake Janis'yarvi, Karelian SSR, U.S.S.R.	61°58'N 30°57'E	D-3	201/016	1662-08473 May 6, 1974	14	700	Cry	6	C
Lake Lappajarvi, Finland	63°09'N 23°42'E	D-3	205/016	1216-09172 Feb. 24, 1973	14	77±4	Cry	6	C
Karla, Tatar SSR, U.S.S.R.	55°00'N 48°20'E	E-4	185/021	2138-07123 June 9, 1975	10	10	Sed	4	C
Mishinogorsk, RSFSR, U.S.S.R.	58°35'N 28°07'E	D-3	201/019	2460-08352 Apr. 26, 1976	9	<360	Sed(Cry)	5	C
Vepriaj, Lithuanian SSR, U.S.S.R.	55°06'N 24°36'E	E-3	202/021	2199-08254 May 5, 1978	8	160±30	Sed	?	?
Ternovka, U.S.S.R.	51°19'N 42°58'E	F-4	187/024	2608-07160 Sept. 21, 1976	6	?	Sed	?	?
Kursk, Russian SFSR, U.S.S.R.	51°40'N 36°00'E	E-4	192/024	2793-07373 Mar. 25, 1977	5	250±80	Sed&Cry	5	C
Lake Mien, Sweden	36°25'N 14°55'E	D-2 E-2	209/021	2036-09303 Feb. 27, 1975	5	118±2	Cry	6	C
Lake Säksjärvi, Finland	61°24'N 22°22'E	D-3	205/017	2104-09053 May 6, 1975	5	490	Cry	7	?
Misarai, Lithuanian SSR, U.S.S.R.	54°00'N 23°54'E	E-3	202/022	2155-08503 June 26, 1975	5	500±80	Sed?	?	?
Rotmistrovka Ukrainian SSR, U.S.S.R.	49°00'N 32°00'E	E-3	193/026	2074-08003 April 6, 1975	5	70	Cry	4	S
Soderfjärden, Finland	63°02'N 21°35'E	D-3	207/016	1038-09275 Aug. 30, 1972	5.5	600	Cry	5	C

Table 5c (Continued)

Il'ineti, Ukrainian SSR, U.S.S.R.	48°55'N 28°54'E	E-3	196/026	2959-07523 Sept. 7, 1977	4.5	495±5	Cry	5	C
Kiardia, Latvian SSR, U.S.S.R.	57°00'N 22°42'E	D-3	203/020	2606-08461 Sept. 19, 1976	4	500±50	Sed?	?	?
Steinheim Basin, Germany	48°41'N 10°04'E	E-2 F-2	208/026	1309-09383 May 28, 1973	3.4	14.8±0.7	Sed	3	C
Zeleny Gai Ukrainian SSR, U.S.S.R.	48°07'N 32°09'E	E-3	191/027	2108-07491 May 10, 1975	1.4	120±20	?	?	S

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill reserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

*Largest crater in field of 7 craters.

Geographic coordinates of USSR impact structures, adjusted to match the approximate centers of large structures (Puchezh-Batunki, Mishinogorsk), or to conform to scant geographic descriptions in the Russian literature (Karia). The geographic coordinates of impact structures occupied by lakes are those of the lake centers.

Table 5d. Europe: Impact Structures (in order of increasing geologic age)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Probable impact craters and astrophiles detectable on Landsat MSS images</u>									
Lake Lappajärvi, Finland	63°09'N 23°42'E	D-3	205/016	1216-09172 Feb. 24, 1973	14	77±4	Cry	6	C
Lake Mien, Sweden	56°25'N 14°55'E	D-2 E-2	209/021	2036-09303 Feb. 27, 1975	5	118±2	Cry	6	C
Lake Dellen, Sweden	61°54'N 16°40'E	D-2	209/017	1202-09403 Feb. 10, 1973	15	230	Cry	6	C
Lake Siljan, Sweden	61°02'N 14°52'E	D-2	211/017	1330-09514 June 18, 1973	52	365±7	Sed&Cry	7	C
Lake Sääksjärvi, Finland	61°24'N 22°22'E	D-3	205/017	2104-09053 May 6, 1975	5	490	Cry	7	?
Il'inets, Ukrainian SSR, U.S.S.R.	48°55'N 28°54'E	E-3	196/026	2959-07523 Sept. 7, 1977	4.5	495±5	Cry	5	C
Soderfjärden, Finland	63°02'N 21°35'E	D-3	207/016	1038-09275 Aug. 30, 1972	5.5	600	Cry	5	C
Lake Janis'yarvi, Karelian SSR, U.S.S.R.	61°58'N 30°57'E	D-3	201/016	1662-08473 May 6, 1974	14	700	Cry	6	C
<u>Probable impact craters and astrophiles barely detectable on Landsat MSS images</u>									
Rieskessel, Germany	48°53'N 10°37'E	E-2 F-2	208/026	1309-09383 May 28, 1973	24	14.8±0.7	Sed&Cry	2	Cf
Steinheim Basin, Germany	48°41'N 10°04'E	E-2 F-2	208/026	1309-09383 May 28, 1973	3.4	14.8±0.7	Sed	3	C

Table 5d (Continued)

Chassenon Crater, (Alternate name: Rochechouart), France	45°49'N 0°46'E	F-1	214/028	1243-10141 Mar. 23, 1973	23	160±5	Cry	6	C
Vepriaj, Lithuanian SSR, U.S.S.R.	55°06'N 24°36'E	E-3	202/021	2199-08254 May 5, 1978	8	160±30	Sed	?	?
Puchezh-Katunki Crater, RSFSR, U.S.S.R.	56°56'N 43°42'E	D-3 D-4	188/020	2105-07291 May 7, 1975	80	183±3	Sed&Cry	4	C
Mishinogorsk, RSFSR, U.S.S.R.	58°35'N 28°07'E	D-3	201/019	2460-08382 Apr. 26, 1976	9	<360	Sed(Cry)	5	C
Misarai, Lithuanian SSR, U.S.S.R.	54°00'N 23°54'E	E-3	202/022	2155-08503 June 26, 1975	5	500±80	Sed?	?	?
Proven impact craters not detectable on Landsat MSS images									
Kaalijary Craters, Estonian SSR, U.S.S.R.	58°24'N 22°40'E	D-3	204/019	2103-09004 May 5, 1975	0.11*				
Morasko Craters, Poland	59°29'N 16°54'E	E-3	205/023	2104-09080 May 6, 1975	0.1*				
Probable impact craters and astroblemes not detectable on Landsat MSS images									
Ternovka, U.S.S.R.	51°19'N 42°58'E	F-4	187/024	2608-07160 Sept. 21, 1976	6	?	Sed	?	?
Karla, Tatar SSR, U.S.S.R.	55°00'N 48°20'E	E-4	185/021	2138-07123 June 9, 1975	10	10	Sed	4	C
Kamensk-Gusev, Russian SFSR, U.S.S.R.	48°16'N 40°18'E	F-4	188/026	2573-07234 Aug. 17, 1976	25	65	Sed	5	C
Rotmistrovka Ukrainian SSR, U.S.S.R.	49°00'N 32°00'E	E-3	193/026	2074-08003 April; 6, 1975	5	70	Cry	4	S
Boitysh, Ukrainian SSR, U.S.S.R.	48°45'N 32°10'E	E-3	191/027	2108-07491 May 10, 1975	25	100±5	Cry	4	C
Lognisk, Byelorussian SSR, U.S.S.R.	54°12'N 27°48'E	E-3	198/022	2475-08220 May 11, 1976	17	100±20	Sed?	?	?

Table 5d (Continued)

Zeleny Gai Ukrainian SSR, U.S.S.R.	48°07'N 32°09'E	E-3	191/027	2108-07491 May 10, 1975	1.4	120±20	?	?	S
Obolon, Ukrainian SSR, U.S.S.R.	49°30'N 32°55'E	E-3	191/027	2108-07491 May 10, 1975	15	160	Cry	5	C
Kursk, Russian SFSR, U.S.S.R.	51°40'N 36°00'E	E-4	192/024	2793-07373 Mar. 25, 1977	5	250±80	Sed&Cry	5	C
Kaluga, Russian SFSR, U.S.S.R.	54°30'N 36°15'E	E-4	193/022	2254-07573 Oct. 3, 1975	15	360±10	Sed&Cry	4	C
Kjardla, Latvian SSR, U.S.S.R.	57°00'N 22°42'E	D-3	203/020	2606-08461 Sept. 19, 1976	4	500±50	Sed?	?	?

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sediments, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form. Largest crater in field of 7 craters

Geographic coordinates of USSR impact structures, adjusted to match the approximate centers of large structures (Puchezh-Katunki, Mishingorsk), or to conform to scant geographic descriptions in the Russian literature (Karia). The geographic coordinates of impact structures occupied by lakes are those of the lake centers.

Europe
USSR
Estonskoy SSR, Saaremaa Island
Kaalijarv Craters

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Europe
France, Limousin (Haute-Vienne, Charente)
Chassenon Crater
(Alternate name: Rochechouart Crater)

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Cherkassy Oblast
Rotmistrovka

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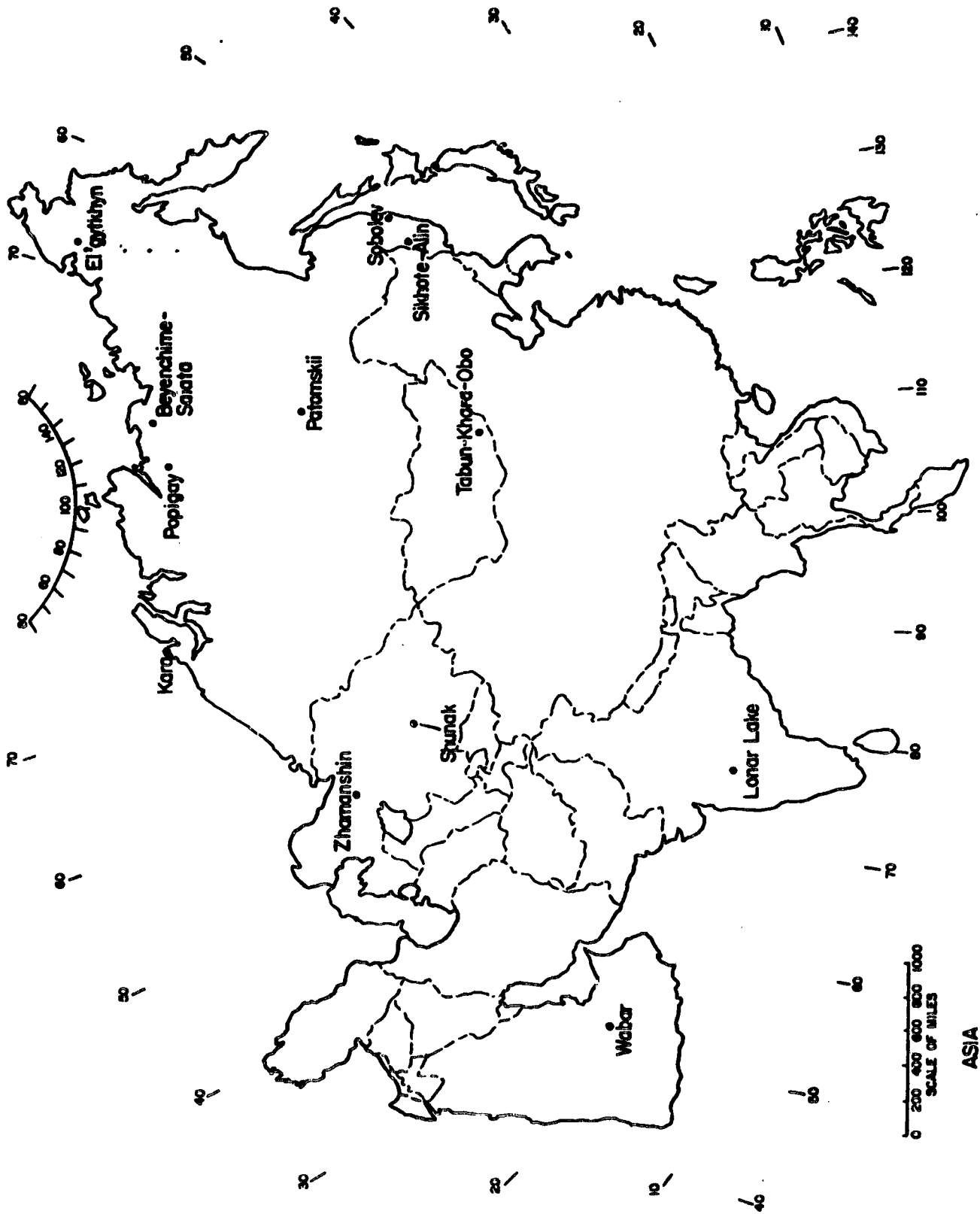


Table 6a. Asia: Impact Structures (in alphabetical order)

Name	3 Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Table 2)	Target Rock	Pres.	Morph.
<u>Proven impact structure</u>									
Sikhote Alin Craters, Primorye Territorie, U.S.S.R.	46°07'N 134°40'E	F-10	121/028	2524-01013 Jun. 29, 1976	0.026*2				
Mabar Craters Saudi Arabia	21°28'N 50°29'E	J-7	175/045	1438-06350 May 4, 1978	0.097*1				
<u>Probable impact craters and astroblemes</u>									
Beyenchime-Salata, Yakotsk SSR, U.S.S.R.	71°03'N 121°40'E	C-6	146/009	1247-03360 Mar. 27, 1973	8	<65	Sed	3	C
Kara, Krasnoyarsk Krai, Russian SFSR, U.S.S.R.	69°07'N 64°24'E	C-4	182/011	1337-07024 June 25, 1973	50	57	Sed	5	C
Lake El'gytkhyn Hagadan Oblast, Russian SFSR, U.S.S.R.	67°29'N 172°05'E	C-7	106/012 104/013	1350-23470 July 8, 1973 1600-23311 Mar. 14, 1974	19	3.5±0.5	Cry	3	C
Lonar Lake, India	19°58'N 76°31'E	J-8	156/046	1167-04481 Jan. 6, 1973	1.83	0.05	Cry	2	S
Patonskii Crater Irkutskoblast, Russian SFSR, U.S.S.R.	59°00'N 116°25'E	D-7	138/019	1419-02522 Sept. 15, 1973	0.09	.0003	Sed	2	S
Popigay, Krasnoyarsk Krai, Russian SFSR, U.S.S.R.	71°37'N 110°10'E	C-5	153/009	1398-04144 Aug. 25, 1973	100	39±9	Sed&Cry	3	Cr

Table 6a (Continued)

Shunak, Kazakh SSR, U.S.S.R.	47°12'N 72°58'E	F-6	165/027	1050-05312 Sept. 11, 1972	2.5	12	Cry	3	S
Sobolev, Primorye Territorie, U.S.S.R.	46°18'N 137°52'E	E-10	120/028	2307-01004 Nov. 25, 1975	0.05	0.002	Cry	2	S
Tabun Khara Obo, Mongolia	44°06'N 109°35'E	F-8	138/029	1527-02544 Jan. 1, 1974	1.3	<30	Cry	2	S
Zhamanshin, Kazakh SSR, U.S.S.R.	48°25'N 61°00'E	E-5	173/026	1418-06161 Sept. 14, 1973	10	4.5±.5	(Sed)Cry	3	C

*ONC: Operational Navigation Chart, 1:1,000,000 scale National Ocean Survey

Grieve, R. A. F., 1982, Table 2

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Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.
*1Larger of two craters.

*2Largest crater in a field of 122 craters.

*3The geographic coordinates of large USSR impact structures are adjusted to match the approximate structure centers (Zhamanshin, Kara, Beyenchime-Salata, and Popigay), or to conform to the geographic description published in the Russian literature (Shunak). Sobolev is located at 137°52'E, not at 138°52'E as shown on Table 2, p. 28 (Grieve, 1982). The geographic coordinates of impact structures occupied by lakes are those of the lake centers.

Table 6b. Asia: Impact Structures (in order of increasing latitude)

Name	Geographic coordinates	OMC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Table 2)	Target Rock	Pres.	Morph.
<u>Proven impact structure</u>									
Wabar Craters Saudi Arabia	21°28'N 50°29'E	J-7	175/045	1438-06350 May 4, 1978	0.097 ^{*1}				
Sikhote Alin Craters, Primorye Territorie, U.S.S.R.	46°07'N 134°40'E	F-10	121/028	2524-01013 Jun. 29, 1976	0.026 ^{*2}				
<u>Probable impact craters and astroblemes</u>									
Lunar Lake, India	19°58'N 76°31'E	J-8	156/046	1167-04481 Jan. 6, 1973	1.83	0.05	Cry	2	S
Tabun Khara Obo, Mongolia	44°06'N 109°35'E	F-8	138/029	1527-02544 Jan. 1, 1974	1.3	<30	Cry	2	S
Shunak, Kazakh SSR, U.S.S.R.	47°12'N 72°58'E	F-6	165/027	1050-05312 Sept. 11, 1972	2.5	12	Cry	3	S
Sobolev, Primorye Territorie, U.S.S.R.	46°18'N 137°52'E	E-10	120/028	2307-01004 Nov. 25, 1975	0.05	0.002	Cry	2	S
Zhamanshin, Kazakh SSR, U.S.S.R.	48°25'N 61°00'E	E-5	173/026	1418-06161 Sept. 14, 1973	10	4.5±.5	(Sed)Cry	3	C
Patonskii Crater Irkutsk Oblast, Russian-SFSR, U.S.S.R.	59°00'N 116°25'E	D-7	138/019	1419-02522 Sept. 15, 1973		.0003	Sed	2	S
Lake El'gytshyn Magadan Oblast, Russian SFSR, U.S.S.R.	67°29'N 172°05'E	C-7	106/012 104/013	1350-23470 July 8, 1973 1600-23311 Mar. 14, 1974	19	3.5±0.5	Cry	3	C

Table 6b (Continued)

Kara, Krasnoyarsk Krai, Russian SFSR, U.S.S.R.	69°07'N 64°24'E	C-4	182/011	1337-07024 June 25, 1973	50	57	Sed	5	C
Beyenchime-Salata, Yakotsk SSR, U.S.S.R.	71°03'N 121°40'E	C-6	146/009	1247-03360 Mar. 27, 1973	8	<65	Sed	3	C
Popigay, Krasnoyarsk Krai, Russian SFSR, U.S.S.R.	71°37'N 111°10'E	C-5	153/009	1398-04144 Aug. 25, 1973	100	39±9	Sed&Cry	3	Cr

*ONC: Operational Navigation Chart, 1:1,000,000 scale National Ocean Survey

Grieve, R. A. F., 2, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

*1Larger of two craters.

*2Largest crater in a field of 122 craters.

*3The geographic coordinates of large USSR impact structures are adjusted to match the approximate structures centers (Zhamanshin, Kara, Beyenchime-Salata, and Popigay), or to conform to the geographic description published in the Russian literature (Shunak). Sobolev is located at 137°52'E, not at 138°52'E as shown on Table 2, p. 28 (Grieve, 1982). The geographic coordinates of impact structures occupied by lakes are those of the lake centers.

Table 6c. Asia: Impact Structures (in order of decreasing diameter)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Proven impact structure</u>									
Mabar Craters Saudi Arabia	21°28'N 50°29'E	J-7	175/045	1438-06350 May 4, 1978	0.097 ^{*1}				
Sikhote Alin Craters, Primorye Territorie, U.S.S.R.	46°07'N 134°40'E	F-10	121/028	2524-01013 Jun. 29, 1976	0.026 ^{*2}				
<u>Probable impact craters and astroblemes</u>									
Popigay, Krasnoyarsk Krai, Russian SFSR, U.S.S.R.	71°37'N 111°10'E	C-5	153/009	1398-04144 Aug. 25, 1973	100	39±9	Sed&Cry	3	Cr
Kara, Krasnoyarsk Krai, Russian SFSR, U.S.S.R.	69°07'N 64°24'E	C-4	182/011	1337-07024 June 25, 1973	50	57	Sed	5	C
Lake El'gytshyn Magadan Oblast, Russian SFSR, U.S.S.R.	67°29'N 172°05'E	C-7	106/012 104/013	1350-23470 July 8, 1973 1600-23311 Mar. 14, 1974	19	3.5±0.5	Cry	3	C
Zhamanshin, Kazakh SSR, U.S.S.R.	48°25'N 61°00'E	E-5	173/026	1418-06161 Sept. 14, 1973	10	4.5±.5	(Sed)Cry	3	C
Beyenchime-Salata, Yakotsk SSR, U.S.S.R.	71°03'N 121°40'E	C-6	146/009	1247-03360 Mar. 27, 1973	8	<65	Sed	3	C
Shunak, Kazakh SSR, U.S.S.R.	47°12'N 72°58'E	F-6	165/027	1050-05312 Sept. 11, 1972	2.5	12	Cry	3	S
Ionar Lake, India.	19°58'N 76°31'E	J-8	156/046	1167-04481 Jan. 6, 1973	1.83	0.05	Cry	2	S

Table 6c (Continued)

Tabun Khara Obo, Mongolia	44°06'N 109°35'E	F-8	138/029	1527-02544 Jan. 1, 1974	1.3	<30	Cry	2	S
Patonskii Crater Irkutsk Oblast, Russian-SFSR, U.S.S.R.	59°00'N 116°25'E	D-7	138/019	1419-02522 Sept. 15, 1973	0.09	.0003	Sed	2	S
Sobolev, Primorye Territorie, U.S.S.R.	46°18'N 137°52'E	E-10	120/028	2307-01004 Nov. 25, 1975	0.05	0.002	Cry	2	S

*ONC: Operational Navigation Chart, 1:1,000,000 scale National Ocean Survey

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

*1Larger of two craters.

*2Largest crater in a field of 122 craters.

*3The geographic coordinates of large USSR impact structures are adjusted to match the approximate structures centers (Zhamanshin, Kara, Beyenchime-Salat, and Popigay), or to conform to the geographic description published in the Russian literature (Shunak). Sobolev is located at 137°52'E, not at 138°52'E as shown on Table 2, p. 28 (Grieve, 1982). The geographic coordinates of impact structures occupied by lakes are those of the lake centers.

Table 6d. Asia: Impact Structures (in order of increasing geologic age)

Name	3 Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Table 2)	Target Rock	Pres.	Morph.
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Probable impacts craters and astroblemes detectable on Landsat MSS images

Lunar Lake, India	19°58'N 76°31'E	J-8	156/046	1167-04481 Jan. 6, 1973	1.83	0.05	Cry	2	S
Lake El'gy'g'ghyn Magadan Oblast, Russian SFSR, U.S.S.R.	67°29'N 172°05'E	C-7	106/012 104/013	1350-23470 July 8, 1973 1600-23311 Mar. 14, 1974	19	3.5±0.5	Cry	3	C
Zhamanshin, Kazakh SSR, U.S.S.R.	48°25'N 61°00'E	E-5	173/026	1418-06161 Sept. 14, 1973	10	4.5±.5	(Sed)Cry	3	C
Shunak, Kazakh SSR, U.S.S.R.	47°12'N 72°58'E	F-6	165/027	1050-05312 Sept. 11, 1972	2.5	12	Cry	3	S
Tubun Khara Obo, Mongolia	44°06'N 109°35'E	F-8	138/029	1527-02544 Jan. 1, 1974	1.3	<30	Cry	2	S
Popigay, Krasnoyarsk Krai, Russian SFSR, U.S.S.R.	71°37'N 110°10'E	C-5	153/009	1398-04144 Aug. 25, 1973	100	39±9	Sed&Cry	3	Cr
Berendzhine-Salata, Yakotsk SSR, U.S.S.R.	71°03'N 121°40'E	C-6	146/009	1247-03360 Mar. 27, 1973	8	<65	Sed	3	C

Proven impact craters not detectable on Landsat MSS images

Wabar Craters Saudi Arabia	21°28'N 50°29'E	J-7	175/045	1438-06350 May 4, 1978	0.097*1				
Sikhote Alin Craters, Primorye Territorie, U.S.S.R.	46°07'N 134°40'E	F-10	121/028	2524-01013 Jun. 29, 1976	0.026*2				

Table 6d (Continued)

Probable impact craters and astrophysical problems not detectable on Landsat MSS images								
Sobolev, Primorye Territorie, U.S.S.R.	46°18'N 137°52'E	E-10	120/028	2307-01004 Nov. 25, 1975	0.05	0.002	Cry	2 S
Patonskii Crater Irkutskoblast, Russian SFSR, U.S.S.R.	59°00'N 116°25'E	D-7	138/019	1419-02522 Sept. 15, 1973	0.09	.0003	Sed	2 S
Kara, Krasnoyarsk Krai, Russian SFSR, U.S.S.R.	69°07'N 64°24'E	C-4	182/011	1337-07024 June 25, 1973	50	57	Sed	5 C

*ONC: Operational Navigation Chart, 1:1,000,000 scale National Ocean Survey
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

*1-Larger of two craters.

*2-Largest crater in a field of 122 craters.

*3-The geographic coordinates of large USSR impact structures are adjusted to match the approximate structures centers (Zhamanshin, Kara, Beyenchime-Salata, and Popigay), or to conform to the geographic description published in the Russian literature (Shunak). Sobolev is located at 137°52'E, not at 138°52'E as shown on Table 2, p. 28 (Grieve, 1982). The geographic coordinates of impact structures occupied by lakes are those of the lake centers.

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CENTRAL AFRICA OF FOUR QUARTERS

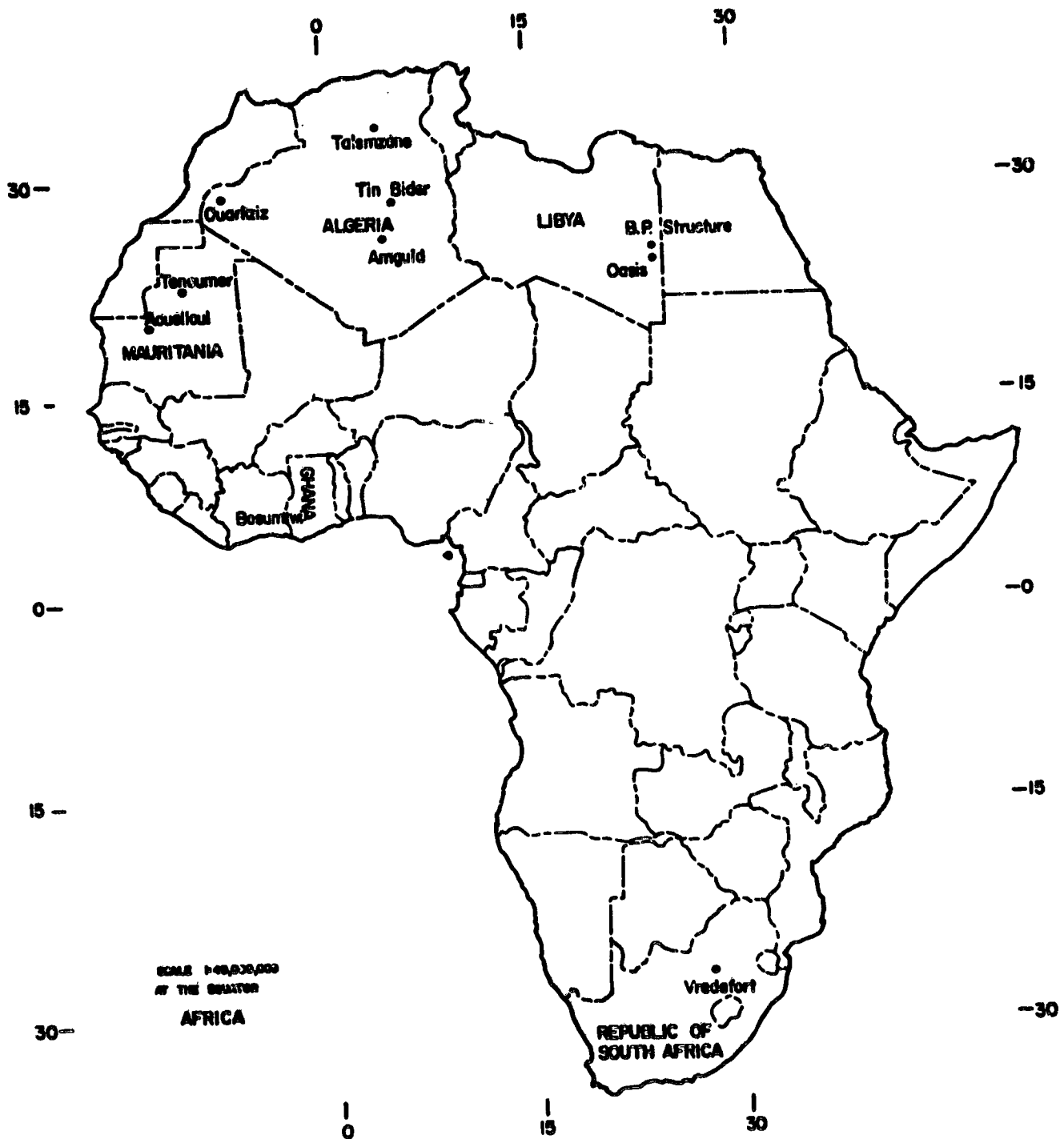


Table 7a. Africa: Impact Structures (in alphabetical order)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Table 2)	Target Rock	Pres.	Morph.
Probable impact craters and astrolemees									
Anguid Crater, Algeria	26°05'N 04°23'E	H-2	208/042	1435-09431 Oct. 1, 1973	0.45	<0.1	Sed	2	S
Aouelloul Crater, Mauritania	20°15'N 12°41'W	J-1	218/046	1229-10443 Mar. 9, 1973	0.37	3.1±0.3	Sed	4	S
BP, (British Petroleum) Libya	25°19'N 24°20'E	H-4	193/042	2362-08044 Jan. 19, 1976	2.8	<120	Sed	6	C
Lake Bosumtwi, Ashanti, Ghana	6°29'N 1°24'W	L-2	208/056	1579-09460 Feb. 22, 1974	10.5	1.3±0.2	Cry	2	C
Oasis, Libya	24°35'N 24°24'E	H-4	193/043	2488-08014 May 24, 1976	11.5	<120	Sed	6	Cr
Quarkiz, Algeria-Morocco border	29°00'N 07°33'W	H-1	216/040	2385-10152 Feb. 11, 1976	3.5	<70	Sed	3	C?
Talenzane Crater, Algeria	33°19'N 04°02'E	G-1 G-2	209/037	2396-09334 Feb. 22, 1976	1.75	<3	Sed	2	S
Tenoumer Crater, Mauritania	22°55'N 10°24'W	J-2	218/044	1103-10431 Nov. 3, 1972	1.9	2.5±.5	Cry	3	S
Tin Bider, Algeria	27°36'N 05°07'E	H-2	208/041	1435-09425 Oct. 1, 1973	6	<70	Sed	6	C
Vredefort structure, South Africa	27°00'S 27°27'E	Q-5	183/079 182/079	1158-07370 Dec. 28, 1972 2315-07173 Dec. 3, 1975	140	1,970±100	Sed&Cry	7	C

Table 7a (Continued)

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.
Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

Table 7b. Africa: Impact Structures (in order of increasing latitude)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
Probable impact craters and astroblemes									
Lake Bosomtwi, Alternate name: Askanti, Ghana	6°29'N 1°24'W	L-2	208/056	1579-09460 Feb. 22, 1974	10.5	1.3±0.2	Cry	2	C
Aouelloul Crater, Mauritania	20°15'W 12°41'W	J-1	218/046	1229-10443 Mar. 9, 1973	0.37	3.1±0.3	Sed	4	S
Tenoumer Crater, Mauritania	22°55'N 10°24'W	J-2	218/044	1103-10431 Nov. 3, 1972	1.9	2.5±.5	Cry	3	S
Casis, Libya	24°35'N 24°24'E	H-4	193/043	2488-08014 May 24, 1976	11.5	<120	Sed	5	Cr
BP, (British Petroleum) Libya	25°19'N 24°20'E	H-4	193/042	2362-08044 Jan. 19, 1976	2.8	<120	Sed	5	C
Anguid Crater, Algeria	26°05'N 04°23'E	H-2	208/042	1435-09431 Oct. 1, 1973	0.45	<0.1	Sed	2	S
Tin Bider, Algeria	27°36'N 05°07'E	H-2	208/041	1435-09425 Oct. 1, 1973	6	<70	Sed	5	C
Quarkiz, Algeria-Morocco border	29°00'N 07°33'W	H-1	216/040	2385-10152 Feb. 11, 1976	3.5	<70	Sed	3	C?
Talenzane Crater, Algeria	33°19'N 04°02'E	G-1 G-2	209/037	2396-09334 Feb. 22, 1976	1.75	<3	Sed	2	S

Table 7b (Continued)

Vredefort structure, South Africa	27°00'S 27°27'E	Q-5	183/079	1158-07370	140	1,970+100	SedCry	7	C
			182/079	Dec. 28, 1972 2315-07173					
				Dec. 3, 1975					

*ONC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

Table 7c. Africa: Impact Structures (in order of decreasing diameter)

Name	Geographic coordinates	Onk*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y. (Grieve, R. A. F., 1982, Table 2)	Target Rock	Pres.	Morph.
<u>Probable impact craters and astroblemes</u>									
Vredefort structure, South Africa	27°00'S 27°27'E	Q-5	183/079 182/079	1158-07370 Dec. 28, 1972 -315-07173 Dec. 3, 1975	140	1,970±100	Sed&Cry	7	C
Oasis, Libya	24°35'N 24°24'E	H-4	193/043	2488-08014 May 24, 1976	11.5	<120	Sed	6	Cr
Lake Bosumtwi, Ashanti, Ghana	6°29'N 1°24'W	L-2	208/056	1579-09460 Feb. 22, 1974	10.5	1.3±0.2	Cry	2	C
Tin Bider, Algeria	27°36'N 05°07'E	H-2	208/041	1435-09425 Oct. 1, 1973	6	<70	Sed	5	C
Quarkiz, Algeria-Morocco border	29°00'N 07°33'W	H-1	216/040	2385-10152 Feb. 11, 1976	3.5	<70	Sed	3	Cr
BP, (British Petroleum) Libya	25°19'N 24°20'E	H-4	193/042	2362-08044 Jan. 19, 1976	2.8	<120	Sed	6	C
Tenoumer Crater, Mauritania	22°55'N 10°24'W	J-2	218/044	1103-10431 Nov. 3, 1972	1.9	2.5±.5	Cry	3	S
Talenzane Crater, Algeria	33°19'N 04°02'E	G-1 G-2	209/037	2396-09334 Feb. 22, 1976	1.75	<3	Sed	2	S
Amguid Crater, Algeria	26°05'N 04°23'E	H-2	208/042	1435-09431 Oct. 1, 1973	0.45	<0.1	Sed	2	S

Table 7c (Continued)

Aouelloul Crater, Mauritania	20°15'W 12°41'W	J-1	218/046	1229-10443 Mar. 9, 1973	0.37	3.1±0.3 Sed	4	S
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*CNC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minor.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 5-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-complex structure with ring form.

Figure 7d. Africa: Impact Structures (in order of increasing geologic age)

Name	Geographic coordinates	ONC*	Landsat Path/Row	Landsat image ID No. and date of Acquisition	Diameter km	Age m.y.	Target Rock	Pres.	Morph.
<u>Probable impact craters and astroblemes detectable on Landsat MSS images</u>									
Lake Bosumtwi, Alternate name: Ashanti, Ghana	6°29'N 1°24'W	L-2	208/056	1579-09460 Feb. 22, 1974	10.5	1.3±0.2	Cry	2	C
Tenoumer Crater, Mauritania	22°55'N 10°24'W	J-2	218/044	1103-10431 Nov. 3, 1972	1.9	2.5±.5	Cry	3	S
Talenzare Crater, Algeria	33°19'N 04°02'E	G-1 G-2	209/037	2396-09334 Feb. 22, 1976	1.75	<3	Sed	2	S
Tin Bider, Algeria	27°36'N 05°07'E	H-2	208/041	1435-09425 Oct. 1, 1973	6	<70	Sed	6	C
Quarkiz, Algeria-Morocco border	29°00'N 07°33'W	H-1	216/040	2385-10152 Feb. 11, 1976	3.5	<70	Sed	3	C?
Oasis, Libya	24°35'N 24°24'E	H-4	193/043	2488-08014 May 24, 1976	11.5	<120	Sed	6	Cr
BP, (British Petroleum) Libya	25°19'N 24°20'E	H-4	193/042	2362-08044 Jan. 19, 1976	2.8	<120	Sed	6	C
Vredefort structure, South Africa	27°00'S 27°27'E	Q-5	183/079 182/C79	1158-07370 Dec. 28, 1972 2315-07173 Dec. 3, 1975	140	1,970±100	Sed&Cry	7	C
<u>Probable impact craters and astroblemes barely detectable on Landsat MSS images</u>									
Amguid Crater, Algeria	26°05'N 04°23'E	H-2	208/042	1435-09431 Oct. 1, 1973	0.45	<0.1	Sed	2	S
Aoueiloul Crater, Mauritania	20°15'W 12°41'W	J-1	218/046	1229-10443 Mar. 9, 1973	0.37	3.1±0.3	Sed	4	S

Table 7d (Continued)

*DNC: Operational Navigation Chart, 1:1,000,000 scale, National Ocean Survey.

Grieve, R. A. F., 1982, Table 2

Sed-Sedimentary, Cry-Crystalline, ()-minnr.

Pres: State of Preservation: 1-ejecta largely preserved, 2-ejecta partly preserved, 3-ejecta removed, rim partly preserved, 4-rim largely eroded, crater-fill products preserved, 5-crater-fill products partly preserved, 6-only remnants of crater-fill preserved, crater floor exposed, 7-crater floor removed, substructure exposed.

Morph: Morphology: S-simple crater, C-complex structure with central uplift, Cr-Complex structure with ring form.

Africa
Algeria
Amguid Crater

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Africa
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Lake Bosumtwi
(Alternate name: Ashanti)

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Africa
Libya, Cyrenaica
Oasis and BP (British Petroleum)

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Africa
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Chassenon Crater	Rochechouart Crater	
<u>Asia</u>		
Wabar Craters	Al Hadidah Craters	
<u>Africa</u>		
Lake Bosumtwi	Ashanti	
<u>South America</u>		
Campo del Cielo Craters	Names of individual craters or meteorites associated with them: Chaco, El Taco, El Mocovi, El Toba, Otumpa	
<u>North America</u>		
<u>U.S.A.</u>		
Barringer Crater	Meteor Crater, Canyon Diablo Ninninger Crater, Coon Mtn., Coon Butte	
Haviland Crater	Name of meteorite associated with it: Brenham, the township's name	
Uvalde	Bee Bluff	
Glover Bluff Structure	Lime Bluff	
Wells Creek area	Cave Spring Hollow, Indian Mound	
<u>Canada</u>		
Charlevoix Structure	La Malbaie	
New Quebec Crater	Chubb Crater, Ungava Crater	

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16. Abstract <p>This bibliography lists 105 terrestrial impact structures, of which 12 are proven structures, that is, structures associated with meteorites, and 93 are probable. Of the 93 probable structures, 18 are known to contain rocks with meteoritic components or to be enriched in meteoritic signature-elements, both of which enhance their probability of having originated by impact. Many of the structures investigated in the USSR to date are subsurface features that are completely or partly buried by sedimentary rocks. At least 16 buried impact structures have already been identified in North America and Europe. No proven nor probable submarine impact structure rising above the ocean floor is presently known; none has been found in Antarctica or Greenland.</p> <p>An attempt has been made to cite for each impact structure all literature published prior to mid-1983. The structures are presented in alphabetical order by continent, and their geographic distribution is indicated on a sketch map of each continent in which they occur. They are also listed in tables in (1) alphabetical order, (2) order of increasing latitude, (3) order of decreasing diameter, and (4) order of increasing geologic age.</p>					
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